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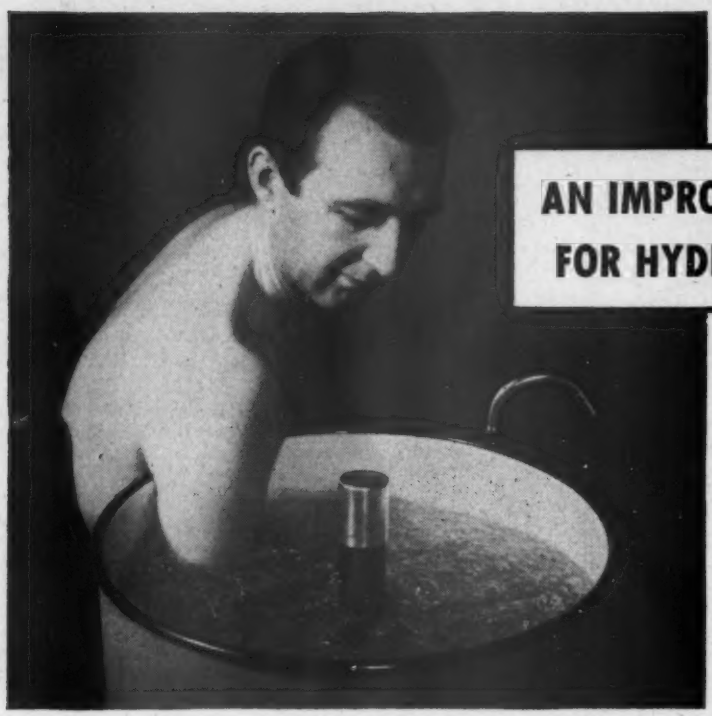

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RECONDITIONING AT AN ARMY AMPUTATION AND NEUROSURGICAL CENTER *

MAJOR ANTHONY C. REIGER

Medical Corps, Army of the United States

Reconditioning has made many advances since its authorization in Army Service Forces hospitals in February, 1943. While its original purpose was to insure a capable return to military duties after illness or injury, present concepts encompass any auxiliary to medical care which helps get the patient out of the hospital faster, improves his general well-being and makes it possible for him to do a better job afterward. Thus, the need for helping the patient to adjust to the temporary or permanent disability, which is a natural consequence of illness or injury, has been recognized to go beyond necessary medical care and the payment of a disability benefit.

The army's program is as diversified as the specialized requirements developed by its individual hospitals. An amputation and neurosurgical center, with its preponderance of permanently disabled patients, offers five compelling challenges to the medical officer.

1. Vigorous, general health should be made available to each handicapped patient. Adjustment is easier if the patient is not irritable from minor intercurrent illnesses. On separation from the service the disabled man will compete for jobs against fully able persons. If an unhandicapped worker is absent frequently from work because of minor indispositions, the employer will often preferably keep another, who, though disabled, is consistent in his daily production.

2. The ability to submerge discontent against disability in satisfying hobby work must be fostered. Most handicapped patients without excellent educational backgrounds obtain monotonous employment which tends to make them concentrate on their physical difficulties. Closer approximation to a normal life may be attained by subrogating complaints against a suddenly disordered existence with pleasurable off-duty activities.

3. The fact that education can be pleasant must be emphasized. Many boys have sighed with relief when they finished their schooling by completing a lower grade school education or were allowed to terminate school because of financial needs. It is therefore important not only to present the advantages which education can offer but to prove to the patient that education can be palatable and enjoyable. The first step on a new way of life should be taken at a time when the acuteness of the patient's own needs is most apparent to himself.

4. Actual training in the manual trades must be offered. It results in confidence in the prosthesis and confidence in the disabled man's ability to compete for a job. It is obvious that specialized training will fit the discharged handicapped veteran for a position which the untrained whole individual could not hope to obtain.

5. The disabled patient's relatives and townspeople must be mentally conditioned to accept him as a capable, adequate individual. A doting mother or well meaning neighbor will often foster feelings of inferiority or inadequacy, by inadvertently calling attention to his disability.

It is significant, therefore, that army surgeons no longer think of treating just another right below-elbow amputation but rather of the problems of a former butcher who has lost a considerable portion of the upper right limb, who quit grade school at the age of 16 before graduating, who had never indulged in hobby work and who was inclined to complain of many minor illnesses, for which his mother constantly treated him.

Excellent results may be expected only if the mission of reconditioning is clearly understood. The integration of the concerted efforts of both hospital personnel and patients must be obtained. For this reason, the hospital adjutant gives each medical officer who reports for duty a booklet "Recondi-

* From the Reconditioning Service, Lawson General Hospital.

tioning Service Data," which describes the scope, facilities and practices of the Reconditioning Service. Each new officer is impressed with the importance of reconditioning and has at his disposal an immediate source of information concerning it. Kodachrome movies of all reconditioning activities are made for presentation to medical staff conferences. In this way,

PATIENT COOPERATION
A—Average
E—Excellent
P—Poor

ARMY SERVICE FORCES
LAWSON GENERAL HOSPITAL
ATLANTA, GEORGIA
RECONDITIONING SERVICE
GROUP 4-3 DAILY REPORT

Check and date a single activity level only. The patient will receive all the activities listed above that level. To advance or retard the patient, recheck and redate at the new activity level. Hiking must be prescribed before discharge to full or restricted duties, and each day's hike must be checked and dated separately. This form will be returned each Saturday morning to the referring medical officer with a cumulative statement of the patient's attendance and cooperation, and will be collected on Monday morning by the Reconditioning Service.

Name: ..... Ward ..... Date ..... To Probable Full Duties ☐
Grade: ..... Hospital Service: ..... ASN ..... To Probable Restricted Duties ☐
Diagnosis: ..... To C. D. D. ☐
Date and Type of Surgery ..... Referring M. C. .....

Will participate in postural instruction, calisthenics graded to the individual stage of convalescence, and basic training in the facings, rests, etc., at 1000 and 1400 daily. In addition, he will carry out the other activities listed for his group during any period he is not required for consultation or treatment.

BED PATIENTS — GROUP 4	
CHECK AND DATE A SINGLE ACTIVITY LEVEL ONLY	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Educational Survey	☐
USAFI Correspondence Course or Self Teaching Texts	☐
Other Educational Pursuits (Daily Films—Demonstrations)	☐
Orientation (Daily Bulletin—Weekly Newsmap, Talks, etc.)	☐
Daily Bed Occupational Therapy (Arts and Skills)	☐
Daily Red Cross Recreational Care	☐
Twice Daily Mild Bed Calisthenics	☐
Twice Daily Progressive Bed Calisthenics	☐
Ambulatory Patients Still in Need of Medical or Surgical Care—GROUP 3 (Optional Orientation Film or Lecture at 1300 Daily in R. C. Hall)	
D Recently Bedridden	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Twice Daily Postural & Basic Training—Graded Calisthenics	☐
Sunbathing, Bowling, Shuffleboard, Golf, etc.	☐
C Intermediary	
Twice Daily Postural & Basic Training—Graded Calisthenics	☐
Mild Gymnastics, Striking Bag, Ping Pong, Goal-Hi, etc.	☐
B Those Almost Ready for Discharge to the Equivalent of Restricted Duties (Include Female Military Personnel)	
Twice Daily Postural & Basic Training—Graded Calisthenics	☐
Moderate Gymnastics, Badminton, Volleyball, Boxing, etc.	☐
A Only Those Shortly to Go to Full Duties	
Twice Daily Postural & Basic Training—Graded Calisthenics	☐
Strenuous Organized Competitive Athletics, Grass Drill, etc.	☐
E	
M. P.'s—Come and Go at Will	☐
Hiking (Prescribe and date separately)	
3-Mile Hike (Preparatory)	☐
6-Mile Hike (Intermediary)	☐
8-Mile Hike (Limit for Restricted Duty Patients)	☐
15-Mile Hike (For Full Duty Patients Only)	☐

LOCATION	R	Original	L	R		L	R		L	R		L	R		L	R		L
3" Above Volar Elbow Crease																		
3" Below Volar Elbow Crease																		
6" Above Patellar Upper Pole																		
3" Below Patellar Lower Pole																		

Notes:

LGH Form No. 88

Exhibit 1

the medical officer is shown the auxiliary care his patient may be given.

On admission, each new patient is given the War Department reconditioning booklet "New Horizons." This portrays the various phases of reconditioning and the results which can be expected. Additional booklets, "It's Fun to Learn" and "We're All Artists," are also presented to the patient. The first describes the advantages of completing United States Armed Forces Institute correspondence of self-teaching courses. Hobby interests

are affirmed in the second. Thus the patient is given an immediate conception of what his hospital stay may be, and his cooperation in physical and educational reconditioning as well as occupational therapy is cultivated.

Included in each new patient's chart is a Class 4-3 Reconditioning Service form (exhibit 1). Its presence in the chart makes it possible to prescribe reconditioning at the same time original orders for diet and medication are written. When the chart is examined later by the ward surgeon, its absence is proof that reconditioning has already been prescribed.

The Class 4-3 form is designed so that reconditioning activities are arranged in progressive strenuousness. By placing one check at the desired activity level an individual reconditioning prescription may be written. All activities above that level are carried out, whereas those below are prohibited. Next to the listed activities are spaces for the days of the month, so that by insertion of an A for average, E for excellent or P for poor in these areas, patient cooperation is graphically presented. The form is returned to the ward surgeon once weekly. If the patient's other medical findings are known, a glance is sufficient to determine whether or not a new activity level should be checked.

With Class 4 (bed) patients, if the level of mild bed calisthenics is checked (exhibit 1), reconditioning personnel carry out the following measures:

1. Orient the patient to the purpose of reconditioning.
2. Conduct a survey of the patient's educational interests, hobbies and aspirations. Arrange for guidance, scholastic accreditation or referral to the personal affairs officer.
3. Enroll the interested patient for a United States Armed Forces Institute correspondence course or lend him a book for a self-teaching course from a mobile USAFI library.
4. Offer him a schedule consisting of:

a. Daily educational films and transcriptions which encourage constructive thinking.

b. Daily discussions or demonstrations by competent patient officers concerning current events, health or the resumption of civilian status.

c. Discussions or demonstrations by outstanding civilians on subjects of general cultural interest or those concerned with new job vistas.

(1) "Men of History," a description of how various personalities have influenced history.
(2) Travelogues.
(3) Sports.
(4) Photography.
(5) Art, literature and musical interpretation and appreciation.
(6) "Industry Speaks," a program which brings leaders of industry to the wards with information concerning postdischarge job possibilities.
(7) Actual classes in:
(*a*) Blueprint reading.
(b) Dale Carnegie principles.
(*c*) Radio diction, script writing and producing.
(*d*) Housing.
(*e*) Ceramics.
(*f*) Jewelry.

d. Two daily half-hour radio programs over the hospital public address system. In the forenoon, "Listen and Learn at Lawson" offers interesting educational transcriptions. Only professionally transcribed program recordings are used. In the afternoon, "The Disc and Needle Club of the Air" interprets ageless music.

e. Daily quiz and ward discussions by the information and education officer. A daily twelve minute news summary supplemented by a three minute USAFI announcement is read over the air by this office.

f. Professional entertainment, plays performed by patients and visits by celebrities obtained through Special Services.

g. Amateur entertainment, standard movies currently advertised on the marquees of neighborhood theatres and a birthday party for each patient given by the Red Cross.

h. Frequent visits by a traveling library

5. Send the patient a daily bulletin of reconditioning program information called "Your Recovery Day," and other up-to-the-minute educational or orientation literature.

6. Refer the patient for a daily visit by a Red Cross recreational worker.
7. Refer the patient for a daily contact by the occupational therapy department to foster a bed craft project. Red Cross Gray Ladies trained as occupational therapy aides service most of this program.
8. Give the patient bed calisthenics.

If progressive bed calisthentics are prescribed (exhibit 1), all the measures described are carried out except that the exercises are gradually increased in strenuousness and quantity. Mobile gymnasium carts with small dumbbells and spring apparatus are wheeled to those wards where there are a sufficient number of bedridden patients in this group. Bed bicycles, medicine balls, portable dart boards, quoits, indoor golf and horseshoes are also available. Exercises are strictly supervised by a reconditioning officer.

An even distribution of bed patient programs is facilitated through information supplied by three bulletin boards. One shows where concentrations of bed patients are by denoting each by a yellow-headed pin and each ambulatory patient by a blue-headed pin. Another shows where each activity was sent last week. The third shows where each program has been sent so far during the present week. Routing of Special Services, Red Cross and our own activities is merely a matter of checking the bulletin boards for a ward which can best use the specific program. Every effort is made to offer each bed patient participation in a variety of worthwhile pleasurable endeavors throughout his hospital stay.

Class 3 (ambulatory) patients are divided into Sub-classes D, C, B and A, 3D being the mildest in activity (recently bedridden) and 3A the most strenuous (to return to full duty). All receive graded calisthenics and postural instruction (according to the sub-class) at 10:00 a. m. and 2:00 p. m. each weekday in areas outside the most centrally located ward in the hospital. The adjacent Red Cross recreational hall is employed during inclement weather. Attendance is checked carefully. Appointments for treatment are arranged not to conflict with the reconditioning period. Class 3 patients carry out the additional athletic activities prescribed by the ward surgeon on the Class 4-3 form (exhibit 1) if they are not required for consultation or treatment immediately after the calisthenics period. Each patient is checked out of the reconditioning area. Sub-classification of the patient into D, C or B establishes his activity level so that when the ward surgeon makes rounds activities can be increased by giving the patient a slip, properly signed, indicating progression from D to C, or C to B, without waiting for Saturday morning, when the record forms are returned. The reconditioning class designation is written on each patient's bed card by the ward surgeon. This serves a dual purpose in that the ward surgeon has an easily available reminder of the patient's reconditioning status and ward enlisted personnel are able to indicate correctly who is to leave the ward for reconditioning activities at 10:00 a. m. nd 2:00 p. m. If transfers occur, the new ward surgeon and enlisted personnel are able to continue the activities started in the ward of origin.

The outdoor athletic facilities of Sub-Class 3D (for the recently bedridden consist of:

	Simultaneous Capacity
a. Thirty benches for those who must sit during calisthenics	120
b. Six shuffleboard courts	24
c. Five duckpin bowling alleys	20
d. Twelve horseshoe pitching pits	24
e. Nine hole miniature golf course	14
f. Twelve dart throwing racks	24
g. Golf driving range	4
h. Wheelchair bowling alley	2
i. Amputee volley ball	16
j. Five alleys of number bowling	10

k. Indian ball 10
l. Batting mechanism (a mechanical baseball-pitching mechanism for batting)..... 2

The Sub-Class 3C area (intermediary group) has:

	Simultaneous Capacity
a. Platform with ten striking bags	10
b. Two squares of chest weights	8
c. Two squares of wrist rollers	18
d. Foot and leg exerciser	20
e. Four poles of tether ball	8
f. Portable goal-hi standard	20
g. Three exercise swings capable of excellent use by amputees	3
h. Four pingpong tables	8
i. Three lightweight leg presses	3
j. Baseball throwing exercise apparatus which consists of effigies of Hitler, Tojo, etc., mounted so that they are knocked down when hit, only to return to the upright position owing to their weighted bottoms	8
k. Light leg presses	3
l. 24 bicycles	24

The 3B area is reserved for those patients who are being prepared for discharge to civilian status or to the equivalent of restricted duties. It has:

	Simultaneous Capacity
a. Horizontal ladder	8
b. Heavy leg presses	3
c. Bar bells	18
d. Dumbbells	12
e. Ten abdominal boards	20
f. Three trunk exercisers	3
g. One horizontal bar	1
h. One parallel bar	1
i. Two exercise horses	2
j. One vaulting horse	1
k. One basket ball court	10
l. One badminton court	2
m. Four box hockey sets	8
n. Two squares of stall bars	16
o. Two volley ball courts	24

p. On obstacle course for leg amputees consisting of:
   1. A double incline plane set at 15° (40′ long)
   2. A series of tires through which the patient "high steps"
   3. Three series of graduated steps ending with a series of eight steps on one side and six on the other, the last two being of bus height
   4. A full size tricycle
   5. A low and high balance rail
   6. Rough terrain.

All the apparatus were constructed by convalescent trainees and reconditioning personnel from precut pipe and lumber ordered in correct sizes. Construction of this equipment was undertaken because considerable delay in the delivery of commercially available apparatus was anticipated. In addition, the usual factory equipment is designed almost entirely for indoor use. Squares of stall bars, wrist rollers, etc., were constructed because their use adds competitive spirit to the exercising and concentrates the activities so that a single instructor can handle larger groups. The 3D, C and B areas are separated by ward buildings or corridors so that overlapping of activities does not occur.

The hospital's most centrally located ward and its environs is employed as the reconditioning center. One corner of the ward is converted to a "War News Center," where photographs and trophies of overseas combatants are on display. The rear porch is used as a classroom and the side porch allocated for pingpong. Simple apparatus having adjustable energy requirements are placed on the walls of the ward. These include wrist pronator-supinators, wrestling machines, simple arm exercisers and spring apparatus. Quadriceps chairs, exercise bicycles, rowing machines, two-way bowling alleys and shuffleboard courts effectively occupy all the available floor space. Every effort is made to offer variety, competitive features, skill, pleasure and

a challenge to the strength of each patient in the physical reconditioning equipment.

Actual calisthentics are dispensed with as much as possible so that more time can be spent on games. When the weather is unpleasant and indoor activities must be carried out, "chair calisthentics" are given rather than the routine variety. Chairs are placed in rows far enough apart so that the patient's hands barely touch when the arms are fully abducted. Calisthenics are then given, the chairs being used as much as possible during the activities. The period is finished by competition between the various rows of patients in placing a pillow in its slip, passing a medicine ball, etc. Prizes donated by Red Cross are awarded during daily competitions, and exhibitions of patient athletic prowess are held weekly. Better comradeship is encouraged by a state-patient register in the outdoor reconditioning area. Increased patient cooperation and heightened morale have resulted from such planning.

Groups of patients with uncomplicated peripheral nerve injuries are given instruction in special exercises. These are designed to prevent contractures and are to be carried out while the patient is home on furlough or leave. The occupational therapy section also instructs such patients in diversional or occupational activities which can be carried on expediently at home(exhibit 2). Special calisthentics are also given to small groups of paraplegics. Preparation of the upper body for crutch or brace ambulation is emphasized. Dumbbells and spring apparatus are particularly valuable to these patients because each one is able to determine improvement for himself. The ability to handle larger dumbbells or increased sequences of spring apparatus exercises means as much to the patient as weekly comparative arm, forearm and chest measurements mean to the ward surgeon (exhibit 1).

Vigorous preprosthetic physical training is given to single lower extremity amputees in order to insure adequate strength, balance control and confidence in the remaining lower extremity. A rating of E for excellent, A for average and P for poor is given for each of the activities listed in exhibit 3. The physical therapy department has noted that walking reeducation is facilitated by preprosthetic training. As a challenge to proficient use of the prosthesis, an obstacle course is offered to leg amputees. A record of satisfactory completion is sent to the ward surgeon on the same form which contains the preprosthetic training data (exhibit 3). Adequate consideration is given to the varied abilities of the different levels of lower extremity amputees. For instance, high thigh amputees are not expected to "high step."

Pictures of the patients' physical activities are taken by volunteer civilian photographers. These serve four purposes:

1. The technical details of the photography are discussed.
2. After clearance by the public relations officer, the photographs are displayed on the walls of the reconditioning center. Here they stimulate patient interest and demonstrate the manifold activities of the service. They are given to the patient after remaining on display for one week.
3. The patient usually sends the print home to his relatives, assuring them that his condition is not as serious as they may have imagined and that he is adjusting effectively.
4. The photograph may be published by home town newspapers, publicizing the care soldier patients are getting in army hospitals.

All Class 3 patients are members of the 1300 Club. Its only dues are attendance at a daily educational or orientation film, lecture or demonstration at 1 p. m. (1300 hours) in the Red Cross hall. The Audio-Visual Extension Service of the University System of Georgia, lends many 16 mm. educa-

tional films from its library for this program. The large film distributors contribute 35 mm. cartoons and sports shorts which effectively sugar-coat the educational material. This accounts for the consistent high attendance.

The facilities of a hobby shop are available to those ambulatory patients who wish to complete some project started while bedridden or for those

PROFICIENCY RATING
E - Excellent
A - Average
P - Poor

ARMY SERVICE FORCES
LAWSON GENERAL HOSPITAL
ATLANTA, GEORGIA
RECONDITIONING SERVICE

Single Lower Extremity Amputation PRE and POST Prosthetic Training Period Record.

NAME *GRADE* *WARD* *DATE* *Stump Length* *P M D BK AK R L (Circle three)*

Pre-Prosthetic Training

Has completed Pre-Prosthetic Training encompassing the ability to: *Proficiency Rating*

1. *Hop a distance of 100 yards*
2. *Hop up and down a 15 degree incline 40 feet long*
3. *Use the stationary bicycle*
4. *Stand on one foot for five minutes*
5. *Squat and rise 20 times*
6. *Leg press a medium size weight five times*
7. *Fall properly*
8. *Skip rope for 50 counts*
9. *Do 15 sit-ups on 15 degree incline board - hands behind head*
10. *Do 10 trunk twists to each side on the trunk exerciser*
11. *Participate in three of the following sports:*

Miniature Golf	*Bowling*	*Striking Bag*	*Paddle Tennis*
Dart Throwing	*Gymnastics*	*Volley Ball*	*Badminton*
Shuffleboard	*Rowing*	*Goal-Hi*	*Soft Ball*
Horseshoes	*Ping pong*	*Deck Tennis*	*Basket Ball*
Golf Driving	*Batting*	*Bicycles*	*Barbells*

12. *Complete a hobby project of his own choice in the Diversional O. T. Shop*

NOTES:

RECONDITIONING OFFICER DATE

Post-Prosthetic Period

And, after completing walking reeducation by the Physical Therapy Department, was able to:

1. *Walk up and down steps - bus height steps included*
2. *Walk up and down a 15 degree incline plane*
3. *"High-step" thru a series of tires*
4. *Walk a balance rail 5 inches wide - 4 inches and 16 inches above ground level*
5. *Walk over irregular terrain*
6. *Ride a full size tricycle*
7. *Skip rope*
8. *Run 50 yards*
9. *Do 20 trunk twists to each side on the trunk exerciser*
10. *Do 25 sit-ups on an inclined board set at 15 degrees*
11. *Compete in six of the following sports:*

Miniature Golf	*Bowling*	*Training Bag*	*Paddle Tennis*
Dart Throwing	*Gymnastics*	*Volley Ball*	*Badminton*
Shuffleboard	*Rowing*	*Goal-Hi*	*Soft Ball*
Horseshoes	*Ping pong*	*Deck Tennis*	*Basket Ball*
Golf Driving	*Batting*	*Bicycles*	*Barbells*

12. *Drive a car and change a tire*

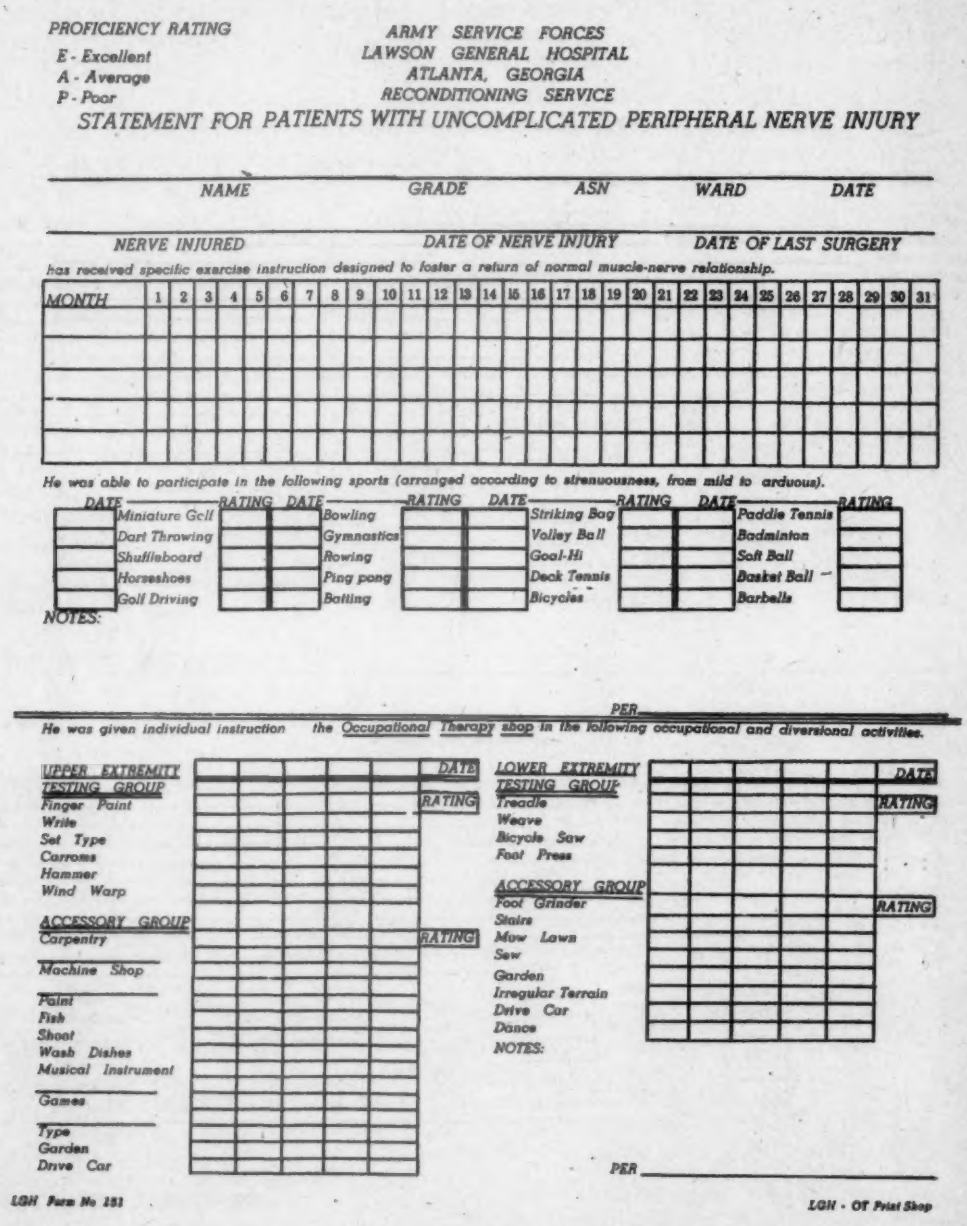
NOTES:

RECONDITIONING OFFICER DATE

Exhibit 2

who want to find relaxation in crafts. Classes in sketching, ceramics, jewelry and radio repair are conducted. Twice weekly, a radio workshop, sponsored by a radio guild, offers instruction in script writing, announcing, producing and directing. Piano and shorthand instruction are also given twice weekly. A weekly Disc and Needle Club fosters appreciation of classical music. Refreshments and pretty girls provide a cordial atmosphere. A patient dance is held every two weeks.

A preemployment training section, staffed by volunteer instructors, offers classes in blueprint reading, motor mechanics, refrigeration, electricity, welding and standard machine shop practice. A separate building contains four metal-working lathes, a grinder, an arbor press, a shaper, a milling machine, a metal-cutting band saw, a drill press, various mechanic's tools, a panel revealing the intricacies of refrigeration; an assortment of overhead



PROFICIENCY RATING
E - Excellent
A - Average
P - Poor

ARMY SERVICE FORCES
LAWSON GENERAL HOSPITAL
ATLANTA, GEORGIA
RECONDITIONING SERVICE

STATEMENT FOR PATIENTS WITH UNCOMPLICATED PERIPHERAL NERVE INJURY

NAME GRADE ASN WARD DATE

NERVE INJURED DATE OF NERVE INJURY DATE OF LAST SURGERY

has received specific exercise instruction designed to foster a return of normal muscle-nerve relationship.

MONTH 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

He was able to participate in the following sports (arranged according to strenuousness, from mild to arduous).

DATE		RATING	DATE		RATING	DATE		RATING	DATE		RATING
	Miniature Golf			Bowling			Striking Bag			Paddle Tennis	
	Dart Throwing			Gymnastics			Volley Ball			Badminton	
	Shuffleboard			Rowing			Goal-Hi			Soft Ball	
	Horseshoes			Ping pong			Deck Tennis			Basket Ball	
	Golf Driving			Batting			Bicycles			Barbells	

NOTES:

PER

He was given individual instruction the Occupational Therapy shop in the following occupational and diversional activities.

UPPER EXTREMITY TESTING GROUP	DATE	LOWER EXTREMITY TESTING GROUP	DATE
Finger Paint	RATING	Treadle	RATING
Write		Weave	
Set Type		Bicycle Saw	
Carroms		Foot Press	
Hammer			
Wind Warp		ACCESSORY GROUP	
		Foot Grinder	RATING
ACCESSORY GROUP		Stairs	
Carpentry	RATING	Mow Lawn	
		Saw	
Machine Shop		Garden	
		Irregular Terrain	
Paint		Drive Car	
Fish		Dance	
Shoot			
Wash Dishes		NOTES:	
Musical Instrument			
Games			
Type			
Garden			
Drive Car			

PER

LGH Form No 151 LGH - OT Print Shop

Exhibit 3

valve, L head, in line, V type and horizontally opposed gasoline engines, both air and water cooled; a variety of carburetors, generators, etc. A sound projector and screen are extremely useful in presenting the correct technics of standard machine shop practice. Descriptive literature and charts are made available to all interested patients. Certificates of proficiency are issued on the completion of a course.

Instructional methods have been changed to accommodate the special requirements of the patients. For example, actual riveting precedes theoretical discussion of it. The patient is allowed to try his riveting gun in order to gain confidence in his ability to handle the tool despite his handicap. This invites didactic instruction. Another change is necessary to accommodate the probability of irregular patient attendance resulting from medical and surgical appointments. "Packaged unit" instruction is offered exclusively, so that if a class is missed the patient will not lose all interest in the course. Each day's discussion is complete in itself. USAFI self-teaching material is used as the course textbook. This is done to insure the patient's interest in case of an interruption due to an operation. Emphasis on the completion of practical projects is another feature of such training. Blueprints are issued so that the patient can complete the project whenever he has free time. The making of products which the patient will find useful after discharge is encouraged. A steak beater is particularly popular. Tours of industrial plants are made to keep the patient job-minded. Such activities inspire confidence in the recently handicapped patient's choice of vocation.

Each amputee has the opportunity to learn to drive a car or to refresh this ability. A standard car possessing no special device is used for instruction. To those who desire it, driver's license testing is carried out by the State Highway Patrol on the hospital grounds. An official license is granted to every successful applicant. Certificates of driving proficiency are issued to those living in other states after completion of a similar test.

Plays, staffed by ambulatory patients and supervised by Special Services, are pleasant divertisements for bed patients and are enthusiastically received when presented in the Red Cross hall.

Patients' personal problems are solved by another division, especially trained for this function. The separation and classification officer offers psychometry to those patients who are not certain as to the type of work they expect to do after discharge.

Reconditioning of officers is similar to that of the enlisted group, except that officers are put in charge of specific activities when possible. In addition, they are required to discuss or demonstrate the specialty in which they are qualified or to conduct group discussions of current events. Bed calisthenics are also given by patient officers after proper training. Women patients are treated similarly to men patients except for the limitation of Class 3 to D, C and B activities.

No detailed discussion of occupational therapy's contribution to reconditioning has been offered, since this is being made the subject of another paper. Suffice it to say that every effort is made to interest patients in satisfying hobby work. Occupational therapy for neurosurgical patients depends on the type and extent of injury and the interests and ability of the patient. Arm amputees are required to complete a preprosthetic schedule which has as its main purpose:

1. Development of good work habits.
2. Training of the new dominant hand.
3. Increase of patient confidence through observation of others with prostheses.

This is followed by a postprosthetic achievement training period which encompasses practically every common action of the upper extremities. In turn, this is followed by a proficiency training period. Discharge from the hospital occurs after completion of an "obstacle course" of two-handed accomplishments within a stated time limit.

MAPPING SENSORY NERVE INJURIES

MAJOR G. D. WILSON

Medical Corps, Army of the United States

Evaluating peripheral nerve injuries as to amount of injury, exact dermatome pattern and progress of recovery is best accomplished by testing for absence of pain and temperature sense and sweating. The methods found most satisfactory are the pin scratch test, use of hot and cold metal and the 2-6 disulfonic acid dye (quinizarin) test[1] for the sweat pattern. Other tests used but not discussed here are the electrical skin resistance test of Richter[2] and the starch-iodine test of Minor.[3] The colorimetric test of Silverman and Powell[4] also may be mentioned.

Peripheral nerve injuries and vascular damage of some degree are common sequels to combat injuries. Physical therapeutic measures speed the patient's recovery, and progress is accurately measured with these tests.

The autonomic nervous system is so closely related anatomically to both the peripheral nerves and the vascular system that an accurate colorimetric method of mapping the sweat pattern changes in order to test sudomotor activity is important. The present study was undertaken with the idea of overcoming the obstacle of having a suitable dye, such as 2-6 disulfonic acid (quinizarin[5]), run and streak the mapped area of sudomotor activity.

The improved technic was found practical in the following conditions and circumstances: peripheral nerve injuries, causalgia, ligation of large arteries and veins, thrombophlebitis, sympathetic nerve block, burns, arteriovenous aneurysm and fistula, skin grafting, hypertrophic arthritis, herniation of intervertebral disks and postsurgical nerve repair.

Technic

The extremity or anatomic area to be tested is dry shaved with a safety razor. In all cases of causalgia, when the razor was stroked over skin distal to the wound the patient complained of an electric-like tingling sensation similar to that of Tinel's sign.

Absence of pain sense is best determined by pin scratch from dull areas to the points of sharp pain, the points being connected by an unbroken line made with a red crayon-type pencil. Care must be taken to have the patient distinguish between sharp pain and pressure pain.

Absence of temperature sense is determined with hot and cold metal and the areas marked by an X with red pencil.

The areas to be subjected to the colorimetric dye test are then covered with a thin coating of a glycerinated, greaseless, water-soluble jelly. This prevents running or smearing of the dye.

The procedure is as follows: Dip the finger in the lubricant and spread this evenly over the palmar surfaces of the hands. Then apply it to the area to be tested. Allow two minutes for drying. Dust quinizarin powder evenly over the anointed area with a cotton pad. Place the patient in an

1. Rose, D. L.: Colorimetric Demonstration of Sweat Pattern Changes in Peripheral Nerve Injuries, Arch. Phys. Therapy 25:610 (Oct.) 1944.
2. Richter, C. P., and Katz, D. T.: Peripheral Nerve Injuries Determined by the Electrical Skin Resistance Method; I. Ulnar Nerve, J. A. M. A. 122:648 (July 3) 1943.
3. Minor, V.: Ein neues Verfahren zu der klinischen Untersuchung der Schweissabsonderung, Deutsche Ztschr. f. Nervenh. 101:302, 1928.
4. Silverman, J. J., and Powell, V. E.: Studies on Palmar Sweating, Am. J. M. Sc. 208:297 (Sept.) 1944.
5. Quinizarin Compound, "Wellcome" brand, Burroughs, Wellcome & Co., Inc., was used in these tests.

infra-red light cabinet preheated to 120 F. to cause generalized body sweating. The patient's head being outside the cabinet, a small amount of powder is applied to the forehead and used as indicator for the first drops of sweat. These change the powder to a deep purplish color. When this happens, the cabinet doors are opened and powder is again applied to the tested areas, to insure clearcut results as to areas of anhidrosis, hypohidrosis and hyperhidrosis. The average patient requires four to five minutes in the light cabinet. One patient who had spent three years in the South Pacific required fifteen minutes at a temperature of 120 F. before sweating occurred. When the upper extremities are involved, placing a towel under the axilla prevents excess sweat from running over the powdered areas. Immediately after removal of the patient from the cabinet, the tested areas are photographed. Black and white and colored photographs are studied for dermatome pattern or sensory nerve changes.

The dye has been found to be nonirritating and nontoxic when used over incompletely healed wounds.

Report of Cases

CASE 1 (fig. 1). — A 22 year old soldier was burned in an airplane crash in China, receiving second and third degree burns of the right hand, shoulder and elbow and the scalp. Four months later sensory nerve tests for pain and temperature sense and for absence of sweating were performed. The anhidrotic area represented the entire area with second and third degree burns. The analgesic area over the dorsum of the hand corresponded to a third degree burned area, while the larger area with absence of sweating corresponded to a second degree burned area. There were also marked trophic changes in all finger nails.

Fig. 1 (case 1). — The analgesic area is shown by the unbroken line. The light area represents anhidrosis. The temperature was sense intact.

Fig. 2 (case 2). — The unbroken pencil line reveals the area of absence of pain and temperature sense and sweating.

Fig. 3 (case 2). — Posterior view showing the absence of pain sense, marked by an unbroken pencil line. Sweating and temperature sense were in areas over the involved nerves.

CASE 2 (figs. 2 and 3). — A 30 year old soldier was wounded by a bullet which traversed the right buttock and the pelvis, abdomen and chest, fracturing the right ninth and tenth ribs posteriorly and injuring the right ninth, tenth and eleventh thoracic nerves. There was motor weakness of the right anterolateral abdominal musculature. The results of a sensory nerve examination, including a quinizarin test, performed one hundred thirty-eight days after the injury are shown in figures 2 and 3. The area of analgesia is represented by an unbroken pencil line. Absence of sudomotor activity is represented by unchanged dye coloration over the anatomic distribution of the anterior primary division of the ninth, tenth and eleventh thoracic nerves. Of interest was the presence of the temperature sense inside the analgesic area only where sweating occurred.

Sweating and temperature sense were present over the distribution of the primary division of the thoracic nerves involved.

CASE 3 (fig. 4). — A 19 year old soldier received a penetrating bullet wound which injured the upper third of the right arm and shoulder and caused an incomplete compound fracture of the upper part of the right humerus. The bullet was removed five days later in a field hospital and a plaster cast applied to the arm. The patient was then evacuated to England, where he received twenty-six physical therapy treatments during hospitalization.

Examination one hundred six days after injury revealed trophic changes in all finger nails of the right hand. Motion of the shoulder joint was zero in abduction and posterior flexion, with only 50 degrees of forward flexion. Motor weakness of the central and posterior portions of the right deltoid, the supraspinatus and the infraspinatus muscles was confirmed by reaction of degeneration tests. Sensory nerve tests revealed two circumscribed areas of analgesia over the distribution of the lateral brachial cutaneous nerve. The temperature sense was intact over the axillary nerve. Sudomotor activity was present over the axillary nerve except in areas of scar tissue. There was mild traumatic neuropathy of the motor branch of the axillary nerve.

CASE 4 (fig. 5). — A 31 year old soldier was wounded by shrapnel which penetrated the right foot, causing complete compound fractures of the os calcis, navicular and astragalus bones. The plaster cast was removed seventy-four days after injury, at which time the patient noticed severe pain and had a sensation as of electricity over the analgesic area on the ball of his right foot.

The patient reported for physical therapy in a general hospital in the United States one hundred seven days after injury. During examination he jumped out of his chair when his foot was grasped by the examiner. The wound was completely healed and the range of motion of the ankle joint was 150 degrees. A sensory nerve test revealed

Fig. 4 (case 3). — The penciled circles indicate the absence of pain sense. Temperature sense and sweating were present.

Fig. 5 (case 4). — There was absence of pain and temperature sense and of sweating over the distal end of the median plantar nerve.

a clover leaf shaped of analgesia, and a quinizarin test revealed absence of sweating in exactly this area. Included were the ball of right foot and the plantar surface of the first, second and third toes, corresponding to the distribution of the distal medial plantar branch of the tibial nerve. Temperature sense was absent.

This case represents typical causalgia, with the patient complaining of symptoms that seemed out of proportion to the objective findings until sensory nerve tests were performed. Physical therapy measures quickly alleviated the symptoms.

Summary

The use of 2-6 disulfonic acid is a superior colorimetric method of determining sudomotor activity.

A practical improvement in the technic of applying the dye consisted in careful application of a glycerinated, greaseless, water-soluble jelly which acts as an adhesive base without interfering with sweating.

A patient who had spent over three years in the South Pacific was found to require three times the average period for production of generalized body sweating.

A photographic record of colorimetric tests makes possible careful study of the extent and degree of peripheral nerve damage.

The photographic records reproduced in this article were taken in the clinical photographic section of Oliver General Hospital, Augusta, Ga., by T/5 W. H. Stasch.

EXERCISES FOR THE CONVALESCENT BED PATIENT *

G. MOSSER TAYLOR, M.D.

J. WAYNE McFARLAND, M.D.

and

ANNA BOND

LOS ANGELES

"Movement is life" was the dictum which guided the brilliant work of Lucas-Championnère. He had seen the permanent disabling affects of a part left at complete rest, as was the fashion in his day in treating most fractures. This law applies all the more to the body as a whole. It is almost superfluous to mention the effects of complete inactivity. Muscles lose their tone and strength; they atrophy. Joints lose their range owing to loss of elasticity of their enveloping capsules as well as of the muscles that move them. With exercise the circulation is stimulated. According to Best and Taylor[1] twenty times as much blood is forced through an active muscle as through a resting one.

It is obvious that many convalescents from surgical measures and from disease need absolute rest, but there does come a time when the patient must be encouraged to use the parts not involved by the lesion from which he is recovering. The exercises prescribed usually require modification to fit the physical condition as it has been affected by the disease or operation sustained.

The patient may be weak and consequently unable to put much physical force into the movements, but the frequent effort of going through the motions will result in more perfect re-coordination of mind and muscle. It is therefore all important for the patient to pay strict attention to what he is attempting to do, particularly during the relaxation phase.[2] Only in this way can abnormal tensions be spotted and released.

To quote from an old Chinese record, "Gymnastic exercises stimulate the bodily fluids to an even motion which constitutes a condition of health. This motion is facilitated by the lying position and impeded by the upright position." Howland[3] more recently has emphasized the value of exercises in the lying position by pointing out the lessened pull of gravity, better alinement of working body segments, more independence of muscle groups and minimal joint strain with fewer leverage factors, with consequent reduction of fatigue and tension.

These exercises are planned for basic needs. Every muscle group is activated with a minimum of repetition. The important feature is that the movements are systematized, simple to learn and easy to do. They can be used by young or old, weak or strong. The system is designed for a minimum of exposure of the patient and inconvenience to the nursing staff. No apparatus is needed and even the bed is little disturbed.

The exercises are applicable to any bed patient, no matter what his medical or surgical classification. In cases of elective surgery, particularly when the patient is an older person whose morale and resistance are to be

* From the Departments of Orthopedic Surgery and Physical Therapy, College of Medical Evangelists.

1. Best, C. H., and Taylor, N. B.: Physiological Basis of Medical Practice, ed. 3, Baltimore, William & Wilkins Company, 1943, p. 544.
2. Jacobson, Edmund: Progressive Relaxation, ed. 1, Chicago, University of Chicago Press, 1929.
3. Howland, I. S.: The Teaching of Body Mechanics, New York, Barnes & Co., 1936.

kept at the optimum, an effort at instruction in the exercises beforehand would be time well spent. How much of the routine is done each day will depend on the patient's strength and cooperation and the lesion for which he is being treated. Exercises may be started as early as twenty-four to forty-tight hours after operation. Patients are instructed generally to practice their routine before each meal or three times a day.

The success of these exercises with any patient depends largely on the teaching carried out by the doctor, nurse or technician, who must themselves know the exercises and the reasons for them. They must know the patient, psychologically as well as physically, and must have his confidence and cooperation. No cause, such as overenthusiasm of a technician, must lead a patient to feel that he is being imposed on. Fatigue should be avoided. The "teacher" is always to appear as a "helper" not as an "overlord." Patience, sincerity and optimism all will stimulate the patient himself to health.

General Instructions

The patient is made comfortable lying flat on the back, preferably without a pillow. The hands are placed near the head, the elbows flexed resting on the bed. The feet are held about a foot apart, with toes pointing straight

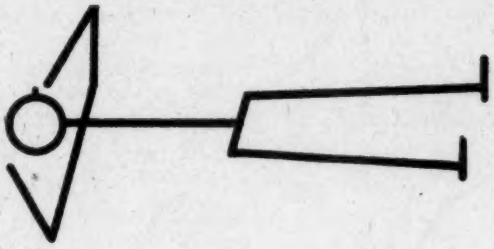


Fig. 1

up (fig. 1). The covers need not be removed, but must be made loose.

All movements are to be repeated three times unless the directions indicate otherwise and are to be done slowly, in three phases: (1) strong contracture or tensing of muscles (when a hold is indicated it is done to the count of three), (2) conscious relaxation and (3) complete rest.

Feet and Legs

I. (*a*) *Toe Stretch* (*Fig. 2*). — The toes are extended and spread as far apart as possible and then the foot and all the toes are strongly and slowly pulled into full plantar flexion, the patient attempting to touch the bottom sheet.

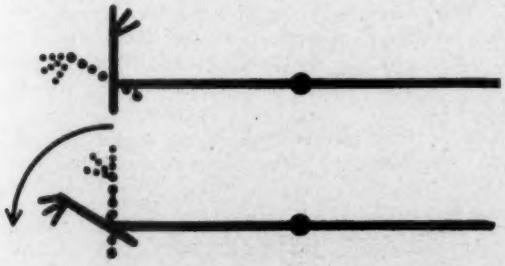


Fig. 2

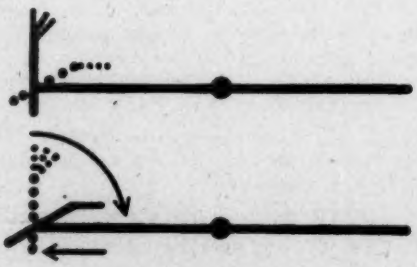


Fig. 3

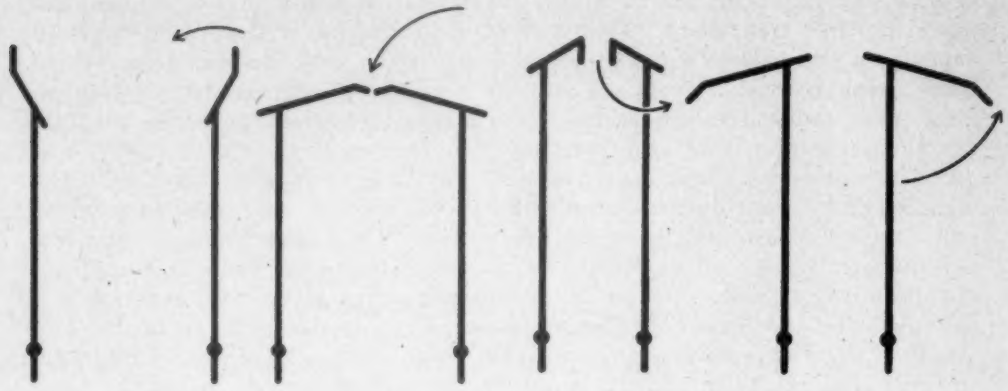


FIG. 4

Fig. 5

I. (*b*) *Heel Stretch* (*Fig. 3*). — From the basic position, the foot is pulled into full dorsiflexion and the heels forced toward the foot of the bed. The knees are hyperextended.

I. (*c*) *Toeing In* (*Fig. 4*). — The legs are internally rotated so that the big toes meet, touching the bed. All the toes are firmly flexed, and the feet are drawn up into full dorisflexion, the inner borders of the feet touching the bottom sheet as closely as possible.

I. (*d*) *Toeing Out* (*Fig. 5*). — The legs are rotated outward so that the little toes are touching the bed. This movement is completed by the heel stretch, the outer borders of the feet touching the bottom sheet. The knees are again hyperextended.

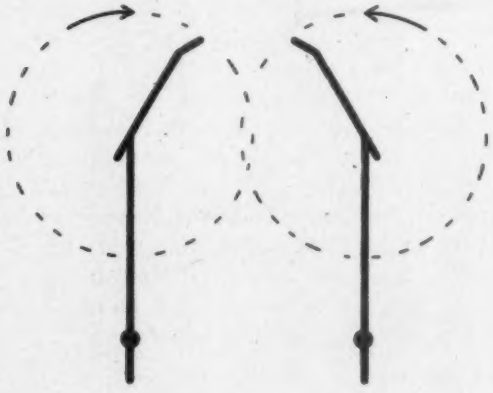


Fig. 6

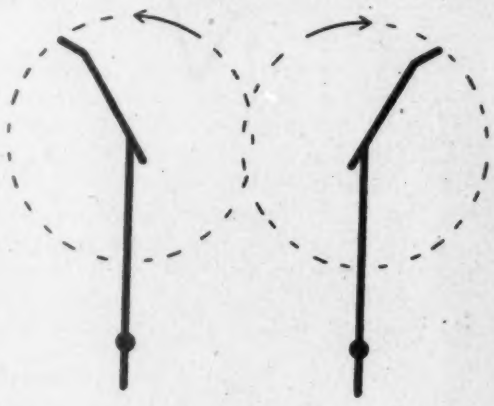


Fig. 7

II. (*a*) *A Circle with Toes* (*Fig. 6*). — The circle is made with the toes attempting to reach the extreme ranges accomplished in the four movements just described. The exercise is begun in full toe stretch, the toes rotating in and up, then out and down to the starting position. Grasping of the toes and contracture of the muscles of the arch should be emphasized.

II. (*b*) *The Circle in Reverse* (*Fig. 7*). — The movement is again begun in full toe stretch, the toes rotating out and up, then in and down. With this movement, the heel stretch is emphasized.

Rationale. — In these exercises the muscles responsible for the efficiency of the arches of the feet are put into thorough training, particularly the tibialis anterior and posterior, as well as the flexors of the toes. The heel cord stretching is an important element in relieving tension that is a precursor to arch strain.

Exercises for the feet will be used most frequently, since these parts

are unaffected by most diseases and surgical operations. The common denominator in phlebothrombosis and pulmonary embolism is confinement to bed. The reason for going to bed is unimportant.[4] Pulmonary embolism is really more common in persons dying of medical diseases and is disclosed by 10 to 12 per cent of routine postmortem examination on adults. From the standpoint of the circulation, exercise is the most easily applied of known prophylactic measures against phlebothrombosis, thrombophlebitis, and embolism, as shown by de Takats and Jesser[5] and Gamble.[6]

Foot and leg exercises secondarily affect abdominal muscles, gently stimulating and improving their tone; therefore these exercises can be used in selected cases even after abdominal operations.

Thighs

III. *Walking Uphill Backwards* (*Fig. 8*). — The knees are bent just enough to put the feet flat on the bed. A short step backward and a push downward are made against resistance, the range of the step being gradually increased until the alternating limbs are in full extension and full flexion. For a more powerful effect, the back is flattened and the hips slightly raised so that the feet can press more firmly against the bed.

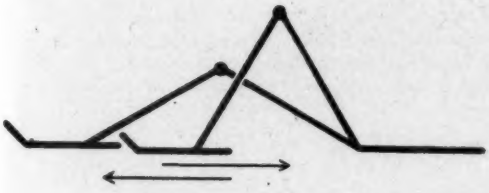


Fig. 8

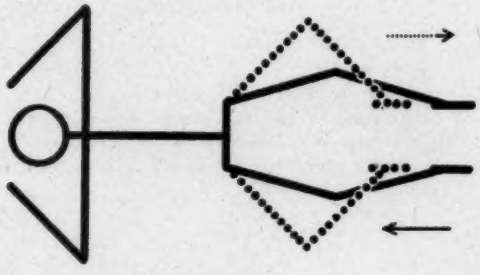


Fig. 9

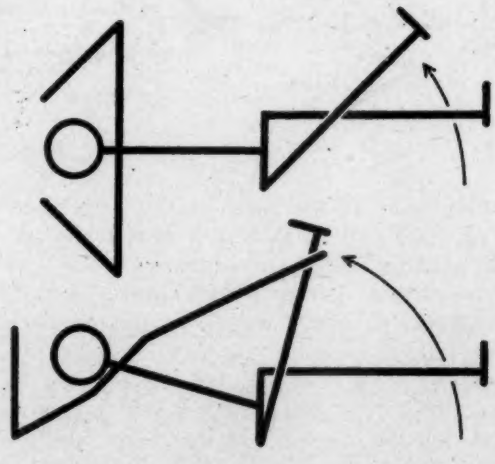


Fig. 10

4. Hunter, W. C.; Krygier, J. J.; Kennedy, J. C., and Sneeden, V. D.: Etiology and Prevention of Thrombosis of the Deep Leg Veins: A Study of 400 Cases, Surgery 17:178 (Feb.) 1945.
5. de Takats, Geza, and Jesser, Joseph H.: Pulmonary Embolism and Suggestion for Its Diagnosis, Prevention and Management, A. M. A. 114:1415 (April 13) 1940.
6. Gamble, H. A.: Prevention of Postoperative Embolism and Phlebitis, Am. Surg. 28:93 (April) 1935.

IV. *Abduction and Adduction* (*Fig. 9*). — The soles of the feet are placed together, with the knees flexed as close to the bed as possible. The thighs are then in abduction. The feet, pressing against the bed, are brought up against resistance in the direction of the perineum. They are then pushed down into the starting position. The fullest range in both directions is the objective. To increase the effect, the back is again flattened and the hips raised.

Rationale. — The two foregoing exercises cover the actions of the quadriceps, hamstrings, abductors and adductors. In addition, the flattening of the back and raising of the hips begin the development of correct body mechanics.

V. *Hamstring, Fascie Lata and Heel Cord Stretching* (*Fig. 10*). — Swing the right leg over the left, keeping the knee in hyperextension and the heel cord fully stretched, with the entire limb held horizontally. Grasp behind the right leg with the left hand. Gradually pull upward toward the head and hold. The farther below the knee the leg is grasped the greater is the force exerted. This exercise is effective but strenuous. It may be many days before the limb can be brought up to a right angle with the body. Repeat the procedure for the left leg.

Rationale. — Low back pain and sciatica are often due to relative contracture of the fascial tissues of the thigh.[7] This may occur as a result of postural defects, inflammatory changes or both. The exercise must be done forcefully and frequently if results are to be expected.

Torso

VI. *Curved Side Stretch* (*Fig. 11*). — The right knee is bent so that the right foot rests flat on the bed near the left knee. With the right foot braced, the right hip is pushed to the left as far as possible. In this position the patient reaches along the bed with the right hand toward and beyond the right foot. Repeat the procedure for the opposite side.

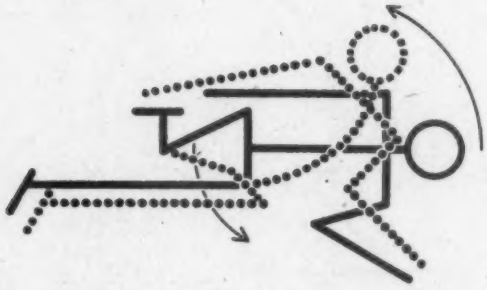


Fig. 11

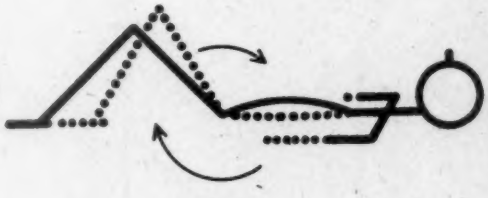


Fig. 12

Rationale. — One side of the torso is thus stretched and the other side contracted. This exercise calls into action practically all the muscles of the body, especially the large muscles of the torso. The twist forces a rotation stretch of the zygapophysial joints of the spine. According to Billig,[8] this effect may in time relieve certain types of dysmenorrhea. His exercise, however, is done standing.

VII. *Pelvic Rotation and Back Flattening* (*Fig. 12*). — The knees are in full flexion, the feet flat on the bed. The back at the waist line is pressed down. By forceful contraction of the buttock and tucking under of the coccyx, the pelvis is rotated forward. (The abdominal muscles assist.) Hold to the count of three and relax.

This movement is repeated three times in three positions: (1) feet close to buttocks, (2) feet halfway down and (3) knees straight.

Rationale. — This is the basic movement which, with practice, will establish conditioned reflexes for good posture. The rotation of the pelvis is to be

7. Ober, Frank R.: Back Strain and Sciatica, J. A. M. A. 104:1530 (May 4) 1935.
8. Billig, H. E., Jr.: Dysmenorrhea, the Result of a Postural Defect, Arch. Surg. 46:611 (May) 1943.

accomplished primarily by the glutei and secondarily by the abdominals, which are the anterior muscles of the spine.

Fig. 13

VIII. *Breathing Exercises* (*Fig. 13*). — The knees are in full flexion, back flat, hands beside head and chin in. Air is inhaled by three or four forceful inspirations, the rib cage being raised and elevated and the lower part of the abdomen kept flat. The breath is held to the count of three and expiration begun slowly. Halfway through this phase two forceful coughs are made, contracting the abdominal muscles.

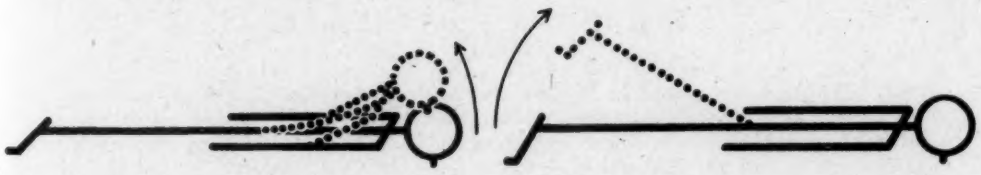


Fig 14

Fig. 15

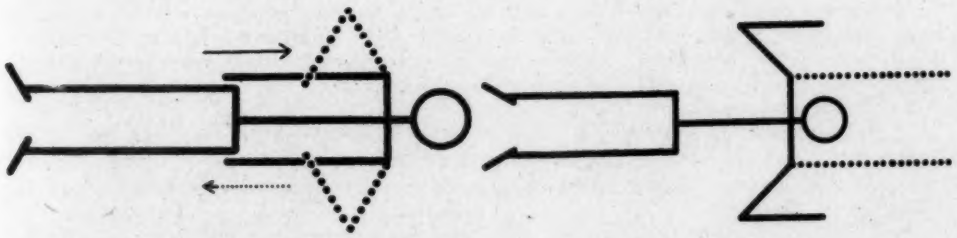


Fig. 16

Fig. 17

Back

IX. *Extension* (*Figs. 14 and 15*). — (*a*) As soon as patients are able to lie prone, extension exercises should be done. With arms at side and palms down, raise the head and shoulders. Hold to the count and relax. (*b*) With knees straight, hyperextend the entire right leg from the hip. Hold to the count and relax. Repeat with the left leg.

Upper Extremities

X. *Pushing and Pulling* (*Fig. 16*). — (*a*) Arms at side. Fists are made with thumb side up, both elbows and fists on the bed. Pressing strongly against the bed, the fists are pulled upward along the side of the body toward the axilla, returning downward with the same force to the original position.

(*b*) With fists thumb side down near the shoulders and elbows flat (fig. 17) firm pressure is exerted with the fists against the bed, the patient pushing upward in as full elevation as possible and then returning downward to the original position, using same resistive force.

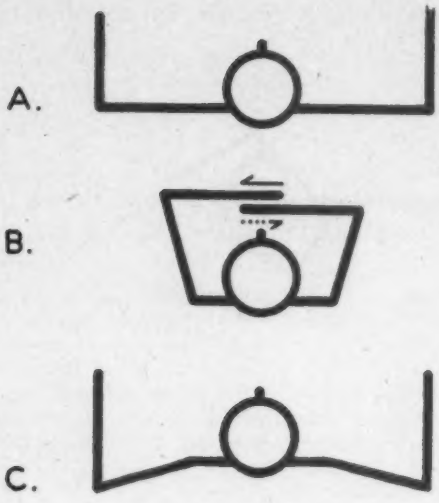


Fig. 18

Fig. 19

(*c*) The arms are placed in 90 degree abduction, with the forearms vertical and the hands making fists. Forward flexion of the shoulders is exerted against active resistance, with the forearms horizontal across the chest, until the elbows meet or pass each other (fig. 18). Return slowly with resistive force to the starting position. In the final movement the elbows are pressed hard against the bed, thus forcing the shoulders to rise. Hold to the count and relax.

XI. *Hands and Wrists.* (*Fig. 19*). — With the elbows resting on the bed a comfortable distance from the sides of the body, the forearms perpendicular, palms facing each other and fingers fully extended, the hands are exercised together.

Beginning with the little finger, flex at the metacarpophalangeal joint, keeping the finger otherwise straight. Follow with the fourth, third and second fingers. Finally the thumb is rotated in opposition, the wrist following in internal rotation and flexion and the thumb itself describing a full circle, requiring movements of the elbows. All movements should be against resistance.

XII. *Head and Neck* (*Fig. 20*). — (*a*) With hands behind the head and chin in, the neck is flexed and extended against resistance of the hands.

(*b*) With hands over the forehead, the neck is again flexed and extended against the resistance of the hands.

(*c*) With the right hand against the right side of the head, left lateral bending is done against resistance of the hand. Then place the hand to the left side of the head for right lateral bending.

(*d*) With the hands clasped high behind the head, rotate the head to the fullest range, the nose making the largest possible circle in the coronal plane. Repeat in the opposite direction.

XIII. *Body Relaxation.* — The patient lies flat on the back, legs out straight, arms at side. General relaxation as complete as possible is obtained. Then one by one the muscle groups are checked by close observation and attention, as for each exercise. The muscles are moved slightly if necessary for orientation. Progress from muscle group to muscle group follows the order of the exercises. This is all done slowly and deliberately.

Concentration is first fixed on the feet to improve their relaxation and then progressively on the calves, thighs, trunk, chest, hands, forearms, arms, neck and face.

Modern life predisposes to a relatively constant abnormal tension of nerves and muscles. Few persons relax naturally, but ability to relax can be developed by conscientious practice. The first step is to recognize muscle tension—complete relaxation. During the relaxation phase of the exercises themselves the patient must constantly observe what is happening, noting the feel of contraction or tension and then of relaxation.

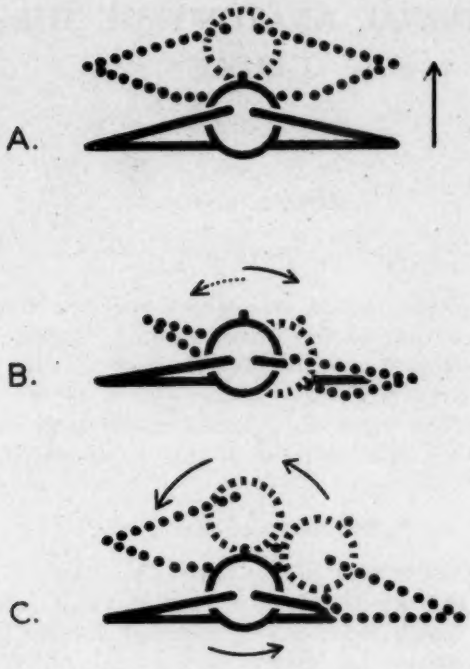


Fig. 20

Conclusion

1. Medical and surgical complications, such as phlebothrombosis, thrombophlebitis and pulmonary embolism, are best prevented by the use of routine exercises.

2. Patients are much better conditioned physically on discharge from bed rest if systematized exercises have been carried out.

3. The basic principles taught in this series of exercises are such that if the exercises are continued indefinitely at home they constitute a simple program of physical conditioning.

Summary

1. A series of twelve exercises is described for the convalescent bed patient.

2. The rationale for the various groups of exercises is outlined.

AUTHORS' NOTE: The exercises described in this article are a simplification of a more complete system too extensive for this publication.

THE FUNCTIONAL ANATOMY OF THE SHOULDER GIRDLE *

DANIEL P. QUIRING, Ph.D.

and

ERNA L. BOROUSH

CLEVELAND

In discussions of the human shoulder girdle two features are frequently overlooked: the evolution of the girdle and its dual function. The first throws light on the adaptive nature of the girdle. The second involves the girdle's ability to maintain a fixed position by rigid bracing when the muscles concerned serve as mechanical struts and the girdle's flexibility when movement is desired. The purpose of this paper is to develop these two aspects.

Evolution of the Girdle

The pectoral girdle of man marks the culmination of a long evolutionary process which started with the fishes. In man the girdle represents a composite of structural adaptations fitting him for specific movements and for a particular environment. The girdle offers evidence that man has descended from tree-dwelling ancestors. Pointing to this ancestry are the relative freedom of arm movements, the anchorage of the arm to the skeleton by the articulating clavicle, and the long latissimus dorsi muscle joining the pelvis to the pectoral girdle.

The pectoral girdle first appears in the cartilaginous fishes, where it is composed of two cartilaginous bars joined in the midventral bone to form a

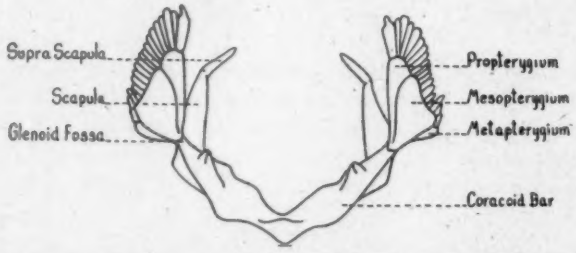


Fig. 1. — The pectoral girdle of the fish consists of paired coracoid bars and scapulas. The fins articulate at the corascapular junctions, the glenoid fossae.

U-shaped support, with which the pectoral fin articulates (fig. 1). The base of the U extends around the ventral side of the fish body and forms the two coracoid cartilages; the uprights of the U form the scapulas. The junction of the scapula and coracoid cartilage is the glenoid fossa, the point of articulation for the pectoral fin.

In contrast with cartilaginous fishes, certain bony fishes exhibit investing or membrane bones. Chief of these are the clavicles, which lie parallel and cephalad to the coracoid bones and supplement them on the ventral side of the body. The distal end of the clavicle extends to the glenoid fossa; the medial end meets the clavicle of the opposite side in midline. Another such investing bone is the cleithrum, which supplements the scapula dorsally and may attach the girdle to the skull.

* From the Cleveland Clinic Foundation.

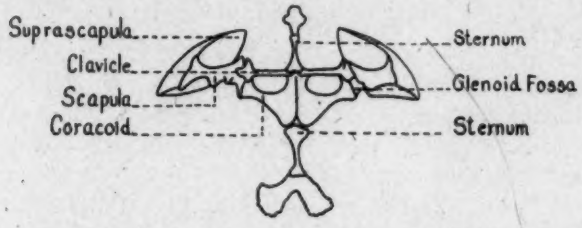


Fig. 2. — The pectoral girdle of the frog consists of the sternum, coracoid and clavicular bars and scapulas. The last three bones articulate at the glenoid fossa with the head of the humerus.

The true sternum first appears in amphibians (fig. 2). In frogs it is greatly developed, extending along the midventral line in a series of expanded plates, to which the medial ends of the clavicles and coracoid processes are joined. The distal ends of the latter articulate with the scapulas. Along the superior margin of the scapula a suprascapular plate is added. As in bony fishes, the clavicle is a membrane bone, whereas the coracoids and the scapulas are first laid down as cartilage and become ossified during later development.

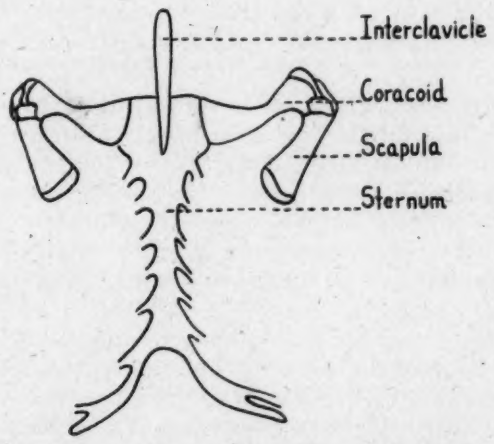


Fig. 3. — The crocodile sternum is greatly extended. Underlying its anterior portion is an interclavicular bone. Paired coracoids articulate with the sternum medially and with the scapulas distally.

Reptiles show further modifications of the pectoral girdle (fig. 3). In many of them, particularly in turtles and crocodiles, the clavicles appear in the embryo but fail to develop in the adult. In the crocodile an interclavicle is retained. The acromion first appears in reptiles as an outgrowth of the anterior ventral portion of the scapula. The coracoids and their modifications are well developed. The medial ends of the coracoids may join the centrally placed epicoracoids. The sternum is usually cartilaginous but is lacking in turtles. In snakes the pectoral girdle has disappeared.

In birds the girdle is a highly specialized system of braces, which adapt the wing for flight and support it (fig. 4). The scapula is a thin, narrow blade extending along the dorsal wall of the thoracic basket. The clavicles join along the midline anterior to the coracoids to form the wishbone, or furcula. The coracoids are relatively heavy, rounded, bracing bones, which extend from the upper end of the sternum to the articulations of the scapulas. The sternum is greatly expanded and in flying birds is extended ventrally into a keel, or carina. The acromion is present in carinate birds but is lacking in nonflying birds.

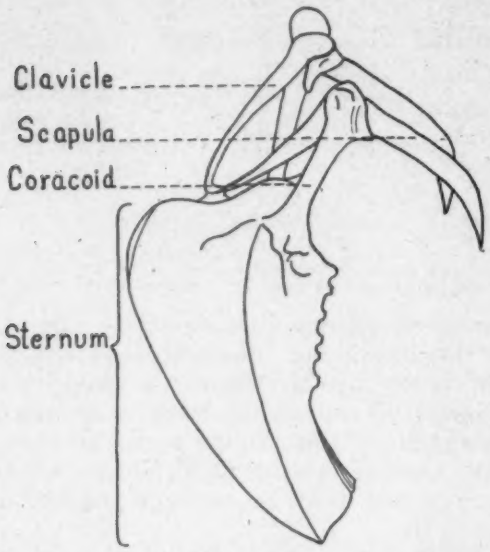


Fig. 4. — The pectoral girdle of the flying bird is characterized by a large keel, with which the coracoids and clavicles articulate. The scapulas extend dorsally from the distal junction of the coracoids and clavicles.

Primates have retained a clavicle in the girdle (fig. 5). This structure is observed in man and in digging animals as well. Apparently the additional support offered by an articulating and bracing clavicle has been responsible for its retention. In contrast, the clavicle in hoofed animals and carnivores is either entirely absent or greatly reduced. In hoofed animals the absence of the clavicle permits close approximation of the forelimbs and is an advantage in running. In carnivores reduction of the clavicle permits greater flexibility of the limb.

The girdle in land animals was originally adapted to support a part of the body weight. In man this function no longer assumes importance, since only in childhood are the forelimbs used to any great extent for body support. In the adult the girdle enables the forelimbs to act as prehensile organs and the body to be suspended by the arms. The girdle further permits the

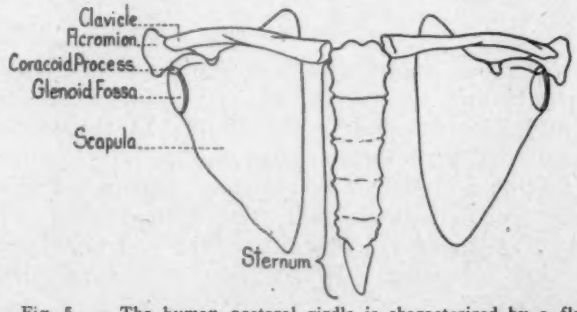


Fig. 5. — The human pectoral girdle is characterized by a flat triangular scapula with a fused coracoid process and a prominent acromion, which articulates with the distal end of the clavicle. The medial end of the clavicle is firmly anchored with the manubrium, forming the sternoclavicular articulation.

forward thrust of the shoulder and arm. Abduction of the arm beyond 90 degrees, a distinctive primate characteristic, is made possible by the trapezius and serratus attachments to the scapula. The clavicle keeps the point of the shoulder permanently abducted, prevents the pinching of nerves and vessels of the upper extremity, and prevents interference with free breathing in brachiating animal.

Human Pectoral Girdle

Outstanding features of the human girdle are the broad, flat scapula, which offers a wide surface for muscular attachment, and the coracoid bone and acromion process, which are fused with the scapula. An additional feature is the clavicle, which is a membrane bone. It is the first to ossify and among the last to show epiphysial closure. The clavicle is the only element in the mechanism that articulates directly with the axial skeleton, through the sternoclavicular joint.

Joints of the Pectoral Girdle. — Sternoclavicular Articulation: The medial end of the clavicle articulates with the sternum through a double arthrodial joint, which permits gliding movements only. An articular disk lies between the medial end of the clavicle and the manubrium. This articulation includes the upper surface of the cartilage of the first rib. A capsular ligament surrounds the entire joint, which is reinforced by an interclavicular ligament joining the right and the left capsule and extending along the upper surface of the sternal notch. On the front of each capsule is an anterior sternoclavicular ligament. On the posterior surface each capsule is strengthened by a posterior sternoclavicular ligament. Lateral to each capsule is a costoclavicular ligament, which ties the medial end of the clavicle to the first costal cartilage and limits upper movement of the clavicle.

Acromioclavicular Articulation: The lateral end of the clavicle is united with the acromion by an arthrodial joint. The joint is usually separated by an articular disk and enclosed by a ligamentous capsule. The distal end of the clavicle is held in position chiefly by the strong coracoclavicular ligament and not by the acromioclavicular capsule alone. The coracoclavicular ligament consists of two parts, a trapezoid ligament, between the upper surface of the coracoid process and the under side of the distal end of the clavicle, and a more medial conoid ligament attaching the coracoid process to the conoid tubercle on the under surface of the clavicle. The trapezoid ligament limits forward movement of the distal end of the clavicle; the conoid ligament prevents undue backward movement. The acromioclavicular ligament, bridging the space between the tip of the acromion and the coracoid process, is not directly associated with the clavicle. Together with the coracoid process and the acromion it forms a vault which protects the head of the humerus.

Innervation and Arterial Supply to the Girdle. — The muscles of the pectoral girdle receive direct innervation from the eleventh cranial nerve and from the cervicle and the brachial plexus. Except for the trapezius and the levator scapulae muscles all are supplied primarily by the brachial plexus. This plexus comprises the anterior rami of the fourth, fifth, sixth, seventh and eighth cervical and first thoracic nerves. The trapezius is innervated by the eleventh cranial, or spinal accessory, and the third and the fourth cervical nerve. The levator scapulae is supplied by the third and the fourth cervical nerve and by the dorsal scapular nerves of the brachial plexus.

The blood supply to the pectoral girdle is provided principally by branches of the axillary artery. These are the highest thoracic, thoracoacromial, lateral thoracic, subscapular, posterior humeral circumflex and anterior humeral circumflex arteries.

Muscle Groups Related to Functions of the Girdle. — The muscles of the girdle fall into three groups according to their attachments (fig. 6). The first group includes the muscles that unite the girdle to the trunk. They are the trapezius, rhomboids, levator scapulae, serratus anterior, pectoralis minor and subclavius. The second group connects the girdle with the upper arm. These comprise the supraspinatus and infraspinatus, teres major

and minor, subscapularis, deltoid and coracobrachialis, all of which originate on the scapula. The latissimus dorsi has one minor origin on the scapula, and the pectoralis major has one origin on the clavicle. Thus, they too unite the girdle with the upper arm. The third group connects the scapula with the forearm. These are the biceps brachii and the triceps brachii.

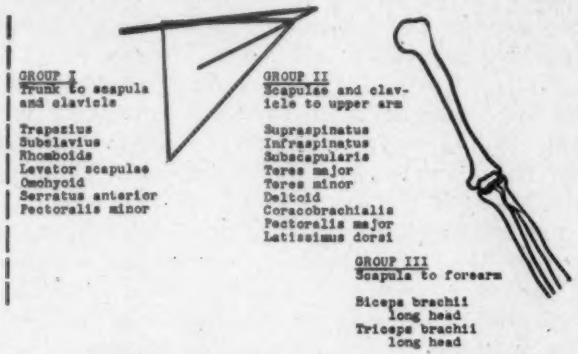


Fig. 6. — The muscles associated with the girdle fall into three distinct groups. Group I unites the trunk with the scapula or clavicle. Group II joins the scapula or clavicle with the humerus. Group III extends from the scapula to the radius and ulna.

The muscles of the first group form the great anchors of the pectoral girdle through which it may be held rigidly in order to give adequate support in the work of the arm and yet enable the entire mechanism to retain sufficient freedom for flexibility of movement of the forelimb. The trapezius forms the great posterior anchor. The upper fibers of the trapezius anchor the scapula vertically, the middle fibers adduct it to the midline, and the lower fibers, pulling against the upper, prevent elevation of the scapula. The serratus anterior prevents winging of the vertebral margin and serves as a horizontal anchor through its extensive attachments along the upper eight or nine ribs and through its insertion along the vertebral border of the scapula. The levator scapulae is another vertical support of the scapula, by reason of its origin on the cervical vertebrae and its insertion along the superior margin of the scapula. The pectoralis minor anchors the coracoid terminus of the scapula to the anterior chest wall and permits only limited movement of this region of the scapula.

The muscles of the second group act on the upper arm. The shorter ones, in addition to their functions of active movement, hold the head of the humerus in place. On the other hand, the latissimus dorsi and the pectoralis major run directly from the trunk to the upper arm. By virtue of the scapular attachment of the latissimus dorsi, winging of the inferior angle of the scapula is prevented, and the upper arm and shoulder may be braced against the body. The pectoralis major, through its clavicular attachment, provides upon contraction a horizontal brace for the upper arm and shoulder.

The third group, comprising biceps brachii and triceps brachii, allows movement at the shoulder and the forearm. The tendons of the long heads of these two muscles blend with and support the shoulder joint capsule.

These three groups of muscles and the associated skeletal mechanism make possible the basic movements of the girdle. These are elevation, depression, abduction, adduction, medial rotation and lateral rotation (fig. 7). Actually the muscles serve a dual purpose: In one instance they may give rigidity to the girdle as a whole, and in the other they make possible the retention of flexibility of movement of the entire mechanism.

Injuries to the Shoulder Girdle. — It is obvious that a mechanism like the shoulder girdle is subjected to frequent strains that may result in fractures or dislocations. Of the two bones composing the girdle, the clavicle is the most frequently injured. The scapula, with the exception of its acromion and spine, is well protected by overlying muscles. Infrequently a direct blow across its body or on the acromion results in fracture.

Injuries to the clavicle involve dislocations and fractures. Dislocations are less frequent than fractures and usually occur at the sternal end. When the shoulder is thrust violently backward and downward, the sternal end

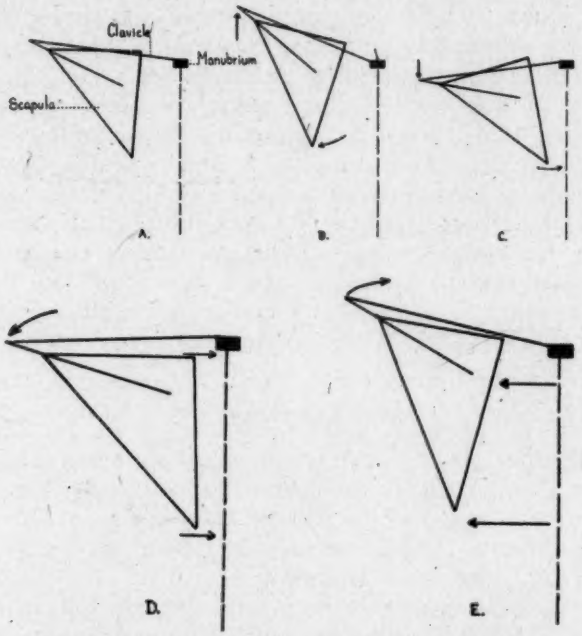


Fig. 7. — The skeletal elements of the shoulder form a mechanical lever system. The fixed point, or fulcrum, for movements of the shoulder as a whole is the sternoclavicular articulation. When the scapula is rotated medially or laterally with the clavicle fixed, the acromioclavicular junction forms a fulcrum. It should be noted that the medial end of the clavicle is the only part of the mechanism that articulates directly with the trunk at the sternoclavicular articulation. The drawings show the positions of the girdle: *A*, normal; *B*, elevation and lateral rotation with the acromioclavicular angle fixed; *C*, depression and medial rotation with the acromioclavicular angle fixed; *D*, abduction, and *E*, adduction.

of the clavicle may be thrown upward, coming in contact with the upper surface of the first rib. The rib acts as a fulcrum, and the force applied at the distal end of the clavicle drives the sternal end from its articular capsule. The acromial end of the clavicle may be dislocated either upward or downward. A thrust at the top of the shoulder at the point of the acromion may drive it downward and displace the distal end of the clavicle upward.

The clavicle is subject to fracture because of its exposed position and because a blow from a fall at the point of the shoulder is transmitted directly to the clavicle. Since the sternal articulation is firmly anchored and the ligaments are stronger than the clavicle, fracture may occur at the middle third of the bone. When this happens, the medial half of the bone is pulled downward and forward by the weight of the arm and the muscles associated with the outer half of the clavicle and the upper end of the humerus. Fractures at the sternal and acromial ends of the clavicle are rare.

Dislocations of the shoulder joint proper are of two types, anterior and posterior. In anterior dislocations the head of the humerus comes to rest anterior to the long head of the triceps brachii muscle. In posterior dislocations the head lies posterior to the glenoid cavity and comes to rest under the spine of the scapula. The frequency of dislocations of the joint appears to be due to its peculiar structure. Davis quoted J. William White, who pointed out the factors contributing to dislocation: shallowness of the glenoid cavity, relatively large size of the humeral head in comparison with the fossa, thinness and laxness of the capsule, maintenance of contact of the joint by muscular action and the atmospheric pressure, long leverage offered by the humerus, and exposed nature of the shoulder.[1]

Fractures by epiphysial separation may occur at the coracoid and acromion processes and at the head of the humerus.

The testing of muscles by motor point stimulation is assuming an increasingly important role in determining the physiologic condition of muscles and nerves, particularly in cases of injury. Testing by this method is confined to the more superficial muscles. Testing of the deep muscles, on the other hand, must be carried out by demanding of the muscles their normal actions by mechanical means. The muscles of the girdle which may be tested by motor point stimulation are the trapezius, latissimus dorsi, rhomboid major and minor, levator scapulae, pectoralis major, serratus anterior, deltoid, supraspinatus, infraspinatus, teres major and biceps and triceps brachii.

Summary

1. The shoulder girdle is the result of a long evolutionary process. In each vertebrate class it adapts the animal for particular functions.

2. The girdle is associated with the axial skeleton through the sternoclavicular articulation. The clavicular and scapular parts are associated through the acromioclavicular articulation.

3. Muscles of the girdle receive their innervation from the eleventh cranial nerve and from the cervical and brachial plexuses.

4. The arterial supply to the girdle is furnished by branches of the axillary artery.

5. The muscles activating the girdle fall into three natural groups: (*a*) those uniting the girdle with the trunk, (*b*) those uniting the girdle with the upper arm, (*c*) those uniting the scapula with the forearm.

6. Injuries of the shoulder girdle occur most frequently at the clavicle. Fracture of the clavicle is more common than dislocation.

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SUMMARY OF THE FIRST ANNUAL REPORT OF THE BARUCH COMMITTEE ON PHYSICAL MEDICINE

To advance and encourage research, teaching and training in the field of physical medicine—and to bring the benefits of this branch of medicine to the rehabilitation of persons maimed in war, industry or by illness—Bernard M. Baruch in 1944 made an initial grant of $1,100,000 to the Baruch Committee on Physical Medicine.

The first annual report of the committee, prepared by the medical director, Frank H. Krusen, M.D., of the Mayo Clinic, has outlined the progress in attaining the objectives of Mr. Baruch's endowment.

Eleven medical schools shared funds in the original grants: Columbia University, $400,000; New York University, $250,000; Medical College of Virginia, $250,000; Massachusetts Institute of Technology, $50,000; University of Minnesota, $40,000; University of Southern California, $30,000; Harvard University, $25,000; University of Iowa, $15,000; University of Illinois, $15,000; Washington University, $10,000; Marquette University, $5,000; Harvard received a later special grant of $30,000 for a special fellowship program.

Dr. Krusen summarized the following progress during the year at the specific institutions:

1. Columbia University, College of Physicians and Surgeons:

Creation of courses leading to a B.S. degree in occupational and physical therapy with enrollment limitation of 50 students yearly in each category.

Plans are well advanced for the merger of New York Orthopedic Hospital with Columbia Medical Center and for a major expansion of physical therapy in the enlarged Vanderbilt Clinic and Harkness Pavilion.

White awaiting the appointment of a research director, the medical school has undertaken to assist various departments in research projects in the field of physical medicine including:

Insulin therapy in combination with fever therapy produced by physical means; studies of electric shock therapy; the effect of temperature on hemorrhage, fluid and electrolyte balance; distribution of volume of blood, and metabolic disturbances resulting from circulatory changes; basic problems of circulation in small vessels and capillaries; the use of radioactive isotopes in circulation investigations.

2. New York University, College of Medicine:

Dr. George G. Deaver has been appointed director of the program as professor of clinical medicine. The departments of physical and occupational therapy at Bellevue Hospital have been combined into one department of physical medicine. Under the new plan, cases whose prognosis had been considered hopeless are now referred to the new department. Also, patients with poliomyelitis are referred for treatment and rehabilitation. Assistance is given to other departments in the treatment of patients with arthritis or fractures.

A feature of the program is a special laboratory where patients can be tested in activities essential to daily living. The use of crutches in walking, climbing stairs or curbs, care of daily need and even left-handed writing are typical examples. Hundreds of copies of the booklet describing these tests have been made available.

An outgrowth of this work is the plan to devise a test to measure a patient's ability to perform any one of the more than 3,000 vocations listed in the job analysis survey of the War Manpower Commission. A physician

who is also an engineer has been assigned to this research project from the Army Air Force.

As a special project, the testing and rehabilitation of cases of spinal cord injury have been outlined in a manual and in sound motion pictures to fit the current needs of soldiers who have spinal cord lesions.

Efforts are under way to evaluate the functional capacity of cardiac patients and recondition them for industrial work.

3. Medical College of Virginia:

Dr. F. A. Hellebrandt has been appointed professor of physical medicine and acting director for the program studying hydrology, climatology and spa therapy.

The director made a complete inspection of Leo N. Levi Memorial Hospital at Hot Springs, Arkansas. The spa is interested in cooperating with the work of the Baruch Committee in research on hydrotherapy.

A basic research laboratory was founded and, despite lack of complete equipment, a research program was inaugurated including the study of: birefringence of mammalian muscles; changes in muscle proteins during atrophy; use of electric stimulation, massage or baths to overcome atrophy. Plans for future research include a study of supersonic waves and the development of technics for creation of uniform arthritic lesions in experimental animals to test various hydrotherapeutic measures.

4. Massachusetts Institute of Technology:

Dr. F. O. Schmitt, head of the departments of biology and biological engineering, has been appointed director of the laboratory of applied biophysics. Dr. K. S. Lion is the immediate supervisor. As equipment on order is received, it is planned to investigate the dielectric properties of muscles and tissues in high frequency fields and nerve impulses by electronic methods.

5. Harvard University:

The Baruch grant was received one month prior to the annual report and in that short time it has been possible only to survey possible personnel and plan research on (1) biochemical factors relating to fatigue and (2) the psychiatric aspects of fatigue in psychoneurotic patients.

6. University of Minnesota:

Since the staff is only partly assembled, no report on research progress is possible at this time, but during the year two groups totalling 14 students have been enrolled in the twelve-month course on physical medicine under the direction of Dr. Miland A. Knapp. A third group of twelve students is currently taking this course. Dr. Herbert Wells has been appointed professor of biophysics and will direct research in physical medicine.

7. University of Southern California:

Under the direction of Dr. Irving Rehman, research planned or in progress includes: the evaluation of compensatory action in muscles or muscle groups; the use of soft tissue x-rays and metal pin implants to study muscle movement; the determination of electrical potentials in muscle contractions; the interruption of neuromuscular pathways by pressure, nerve section and chemicals; the effect of internal environment on regeneration of neuromuscular pathways and return of function.

8. University of Iowa:

Research in progress includes the use of thermogenic agents on deep tissue heating and the effects on circulation of short wave diathermy, in animal experiments.

9. Marquette University.

Research has centered on the effects of temperature changes on the neuromuscular apparatus with especial reference to thermal shock.

10. Washington University:

A two-year research program on bodily mechanics is planned and personnel is being sought to carry it through.

11. University of Illinois:

Teaching personnel is being obtained to establish a training program in occupational and physical therapy.

AMERICAN REGISTRY OF PHYSICAL THERAPY TECHNICIANS — ITS IMPORTANCE

JOHN S. COULTER, M.D.

Chairman, Council on Physical Medicine, American Medical Association

and

MARION G. SMITH, B.S.

Registrar, American Registry of Physical Therapy Technicians

CHICAGO

Sixteen years ago the Council on Physical Medicine of the American Medical Association[1] stated under the education of Physical Therapy Technicians that this course should provide at least 1200 hours over a period of nine months instruction in the theory and application of physical therapy. In 1936, the Council on Medical Education and Hospitals of the American Medical Association[2] published its first list of approved schools for physical therapy technicians. At this time they announced the "Essentials" for training.

In February, 1935 the American Registry of Physical Therapy Technicians was organized and the first examination was given in September of that year. In June of 1936 thirty-one certificates were issued to the first registrants. In 1945 this number had increased to 3,000.

Many persons who had some experience in departments of physical therapy in hospitals of the armed forces or the hospitals of the Veterans Administration are now applying to the civilian hospitals for positions in the department of physical therapy. Much of this experience has been in the rehabilitation of veterans. Civilian hospitals should remember that rehabilitation is not a new form of treatment to be practiced by specialists in rehabilitation. In civilian hospitals rehabilitation requires cooperation between the surgeon, the nurse, the physical therapist, the occupational therapist, the patient and the employer.

Physical therapy plays a most important part in rehabilitation. It can be effective only if the physical therapy technician is well trained. This is shown by registration in the American Registry of Physical Therapy Technicians. There are many reasons for choosing graduates of schools approved for training physical therapy technicians who are registered. We are giving a few of these reasons here.

Elements of Approved Courses

Anatomy. — Physical therapists must be thoroughly familiar with the science of living motion and its attendant problems — leverage, fulcrum, resistance,

1. Education in Physical Therapy by Council on Physical Therapy, J. A. M. A. 94:407 (Feb. 8) 1930.
2. Survey of Schools for Physical Therapy Technicians, J. A. M. A. 107:676 (Aug. 29) 1936.

equilibrium, lines of gravity — and how these relate to each other. They must know how to compose exercises from fundamental and derived positions. They must have a thorough knowledge of muscle reeducation and the ability to assess the effects of gravity on the patient. Exercises are graded by the skill and knowledge of the physical therapist based on an understanding of anatomy.

This understanding can be attained only if the physical therapist has had a course in anatomy much like that given medical students. The course as given to nurses and to students of physical education is not adequate. At Northwestern University the course in anatomy for physical therapists is supervised by the professor of anatomy. In our opinion, such a course should include dissection of the extremity and trunk muscles, including study of the innervation, blood supply, origin and insertion of the muscles. These aspects of anatomy cannot be taught adequately from a book alone or from a skeleton, charts or a living human being.

A technician who has only practical experience does not have enough knowledge of anatomy to give correct exercises, for instance, for the reeducation of the shoulder function. Moseley in a recent book on "Shoulder Lesions," states that resistance exercises are most valuable in overcoming the adduction and internal rotation contracture. This is based on the laws of reciprocal innervation of muscles; the prime mover contracts, the antagonist relaxes. Therefore this resistance exercise encourages movements of the abductor muscles, the deltoid and supraspinatus, while the adductor muscles relax.

Pathology. — Pathology is that branch of medicine which treats of the essential nature of disease or injury, especially the structural and functional changes caused by disease or injury. In an approved course of physical therapy, thirty hours are devoted to this subject. In a college course or course in physical education it is not taught at all.

Two examples from many which could be cited are given to show why physical therapy technicians should know this subject.

1. In asthma, exercises are frequently ordered. The technicians must know the pathologic changes of this disease. The difficult breathing in asthma is expiratory, because during an attack the diameters of the small bronchi are diminished owing to spasm of the muscular coat, congestion of the mucous membrane and excessive secretion of mucus. A properly trained technician knows how to give the asthmatic patient expiratory exercises, which are entirely different from ordinary breathing exercises.

2. The term "fractured ankle" means nothing without knowledge of the pathologic changes involved. There are seven different kinds of "fractured ankle," and unless the technician knows which kind she is dealing with, and understands the changes involved, she may do untold harm to the patient. In one type, weight bearing with crutches may be started in three weeks and full weight bearing in six weeks. In another type, weight bearing with crutches is delayed until at least the eighth week and full weight bearing until at least the twelfth week. The application of massage and exercise must be regulated by the physical therapist according to the pathologic changes involved.

Physiology. — Physiology is the science which treats of the functions of the living organism and its parts. In the final analysis, the success of any form of therapy or therapeutic agent is gauged by its physiologic effects on living patients. The technician must know the physiologic effects that each physical treatment produces. Such knowledge cannot be secured from

experience alone; it needs the basis of lectures by a well trained physiologist, together with laboratory experiments.

It is often observed that any new form of treatment is regarded as valuable by some of the patients who try it. This means that psychic factors may mislead the patient, and the benefit obtained is then the result of psychotherapy rather than of physical therapy. Although ability to understand the psyche should be a part of the equipment of the physical therapist, she must not be misled by psychic factors but must understand the physiologic effect of the treatment.

As an example, the physiologic effect of heat when there is disturbance of the peripheral circulation may be cited. The immediate effect of the absorption of thermogenic radiation by tissues is the production of heat. Whether any marked elevation in the temperature of the tissues will result will depend on their ability to dissipate the heat generated. Temperature will be elevated if the rate of heat generation exceeds the maximum rate at which the tissue can dissipate the heat. Such an effect results when the rate of heat input is relatively low and the physiologic response is impaired; or when the rate of heat input is high and the physiologic response is normal. Therefore, the intensity of radiation to be employed in various conditions is determined by the degree of impairment of the heat dissipating power which is present. In the treatment of certain peripheral vascular diseases by thermogenic radiation, great care must be exercised in order to avoid excessive heating due to the impaired circulation and the consequent inability of the tissues to dissipate heat readily. We have seen severe injury produced in a patient with this condition when the technician, with experience but without the proper background of knowledge, has applied heat in the same way that it would be applied to an ordinary pain from an injury.

Psychology of the Ill and Handicapped. — A requisite for rapid recovery is a helpful and hopeful attitude of mind. If the patient is depressed, bored or filled with self pity, his progress will be slow. Something must be done to interest him. The principles of how sympathetically to consider and overcome such psychologic difficulties are systematically taught only in courses for physical and occupation therapy technicians. The approved course gives 15 hours to this subject.

Physics. — All applied science is built on a groundwork of pure science, and all the appliances used in physical therapy have a basis in pure physics. Therefore, the American Medical Association recommends: 'Courses in general physics and chemistry, as well as biology . . . for all who seek to enter training in physical therapy." The ordinary college course with a major in physical education does not include training in physics as applied to physical agents used in physical therapy. No experience will supply the necessary knowledge of the physics of ultraviolet radiation, electrotherapy and muscle reeducation.

Electrotherapy. — Rehabilitation in World War II has made evident an even greater need for the rational application of electrotherapy.* Such therapy can be administered only by physical therapists who have had thorough courses in electrotherapy and physiology. Technicians must know the how and why as well as the what. Electrotherapy is taught only in approved courses in physical therapy. Sixty-five hours of electrotherapy are given in an approved course.

*Radiation.**. — Physical therapy technicians are constantly required to administer thermogenic and ultraviolet radiation. Thermogenic radiation is heat-

* Roentgen rays and radium are not included.

producing radiation, often called infra-red. The proper application is not simply the placing of a heat lamp over a patient; it requires a knowledge of radiation, because there are different forms.

Ultraviolet Radiation. — Use of this type of radiation by a technician again demonstrates the necessity of an approved course in physical therapy. The difference in dosage is demonstrated by the treatment of acne in contrast to that of psoriasis. A much larger dose is needed for the former. In an approved course for physical therapy, 10 hours are devoted to ultraviolet radiation.

Hydrotherapy. — The external use of water in the treatment of disease is termed hydrotherapy. In no other branch of physical medicine is there more chance of abuse of a simple agent. This is largely because hydrotherapy is so often taught by experience only. Too often, the therapist's knowledge has been derived entirely from experience with the devices or apparatus used in a particular place, and knowledge of the physiologic effects of the treatment is lacking. Academic instruction and experience both are necessary.

Massage. — There is probably no other measure of equal value in medicine which is so little understood and utilized by the medical profession as a whole as is massage. One reason is that massage is so often learned by the operator through experience alone. As a result, a great variety of movements is frequently given in bathhouse style, and massage which should be valuable becomes useless or harmful.

Therapeutic Exercise. — Physical education is exercise of a normal person and is entirely different from therapeutic exercise. Therapeutic exercise involves a thorough knowledge of anatomy, pathology, physiology and physics. It is usually given to strengthen weak muscles, to reeducate muscles with impaired nerve supply — as in infantile paralysis or peripheral nerve injuries — or to increase range of joint movement when this is limited owing to injury or long immobilization. Therapeutic underwater exercise bears only one resemblance to swimming — both are done in water. The two are entirely different and at times directly opposite. Lowman, in his book on underwater gymnastics states: "Physical directors and swimming instructors too often proceed under the fake impression that teaching crippled boys and girls to swim necessarily renders them a service. They may be aiding in the rapid production of deformity by strengthening unaffected muscles, instead of increasing the power of weakened groups of muscles to balance over-active opponents."

Therapeutic exercise is not taught in physical education courses, as it is in courses in physical therapy.

Physical Therapy as Applied to Medicine. — Many examples of the importance of such a course to physical therapists could be cited. Chronic arthritis will serve. Physical therapy is an important adjunct to the treatment of this prevalent disease. The physical therapist is usually asked to give heat, massage and exercise. She cannot learn the proper technics through experience but must have received lectures on the subject from physicians knowing this disease. For instance, one must be extremely careful in applying heat in chronic arthritis complicated by diabetes, loss of sensation, scars or impaired circulation. The type of massage given to a patient with fibrositis (nodules in the muscles) varies considerably from that given to a patient with a painful, swollen joint.

Physical Therapy as Applied to Neurology. — Neurology is that branch of medical science which deals with the nervous system. A condition frequently seen is spastic paralysis due to an injury of the brain or spinal cord, or following apo-

plexy. The affected muscles are stiff or spastic. Since certain groups of muscles are more powerful than others, characteristic deformities result. Intelligent physical therapy applied early can accomplish a great deal. Massage, except mild superficial stroking, is contraindicated as the muscles are in a state of hypertonicity. Careful training must be carried out to develop the power and coordination of the affected muscles. Only a physical therapist who has had a thorough course of lectures by a neurologist, who knows the anatomy and physiology of the nervous system and who understands the results of injury to various areas of the brain and spinal cord can administer proper treatment.

Physical Therapy as Applied to Orthopedics. — Orthopedics is that branch of surgery which deals with the correction of deformities and with the treatment of chronic diseases and injuries of the bones and joints. Many wounded veterans come into the orthopedic service. In an approved course, the physical therapist is taught that the heavy, bath-house type of massage has no place in the treatment of peripheral nerve injuries or infantile paralysis and that such massage may do serious injury to the paralyzed muscles. The technician should have a background of lectures from an orthopedic surgeon explaining what he is trying to do by splinting or by corrective operation. Many months' treatment by the orthopedic surgeon may be ruined by the careless removal of a splint or improper use of physical therapy.

Physical Therapy as Applied to Surgery. — There is no more striking example of the value of specific education versus experience alone than that furnished by a frequent injury, cut tendons. A cut tendon heals slowly and no strain of exercise should be placed on it until at least three weeks after the surgeon has sutured it. This is just one of the principles explained to the physical therapist in the course.

Ethics and Administration. — A college course, especially one in physical education or in "working in a hospital or similar institution," does not provide instruction or experience in the relations that should exist between the physician, the patient and the physical therapist.

Clinical Practice. — In approved courses for physical therapy technicians, students get clinical practice through treating patients under the supervision of graduates of an approved school of physical therapy. On the other hand, in many institutions where "students" or "aides" are employed, there is so much work that the technician has little or no time to supervise these students.

Ethics

The American Registry of Physical Therapy Technicians, which is sponsored and controlled by the American Congress of Physical Medicine, abides by the minimum requirements as set forth by the Council of Medical Education and Hospitals of the American Medical Association for training in physical therapy.

At common law and under most of the applicable state statutes, the practice of the healing art comprises one or more of the following acts: (1) diagnosis; (2) prescription and/or (3) administration. Physicians, then, in giving prescriptions for physical therapy should give complete instruction for the amount, kind and time for the application of the physical agent in question.

Dr. F. H. Arestad, of the Council on Medical Education and Hospitals of the American Medical Association, at a meeting of the Board of the American Registry of Physical Therapy Technicians in September, 1944 stated:

"My own personal feeling about the matter is that the technicians themselves

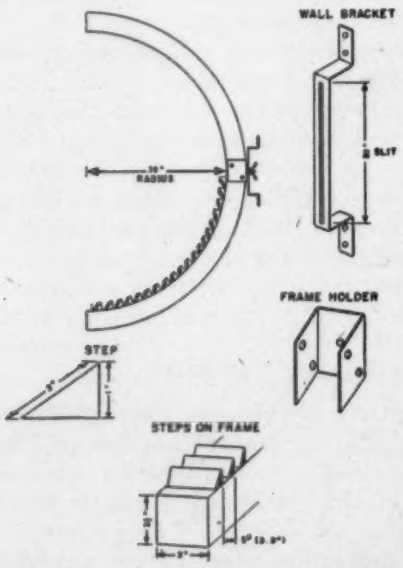
should desire and prefer to be known as aids and assistants to the physicians. In that relationship is their strength. The minute that is disrupted, there may be certain personal gain to individual technicians for the time being, but when you consider the whole field of physical therapy, it will be a detriment, if they through such action lose their support of organized medicine. I do not see how a technician with an independent office can be fulfilling the code of ethics that the registry has established. There is a deeper question than economics. It is a question of future relationship and progress in the field of physical therapy.

"Therefore each registrant signs the following code of ethics:

"'All registered technicians shall be required strictly to observe the Code of Ethics as defined by the American Congress of Physical Medicine; namely, that they shall practice only under the prescription and direction of a licensed physician and shall under no circumstances on their own initiative treat patients or operate an office independently.'"

NEW TYPE SHOULDER LADDER *

In treating disabilities of the shoulder joint, it has been customary to use a shoulder ladder attached to the wall in a vertical plane. Physiologically, the movement of the upper extremity in the shoulder joint is not in a vertical plane, but in one of the many planes of a sphere with the joint as its center. To duplicate as closely as possible this movement during exercise, Captain Henry Fleck has devised a new type of ladder consisting of a semicircular frame of 38-inch radius with steps mounted on it at 5-degree (3.3-inch) intervals. Each step is one inch high. The radius of 38 inches was



chosen because it will satisfy the measurements of the average patient. This entire frame moves up and down in the split of a metal wall bracket by means of a screw and wing nut, and thereby it can be adjusted to the patient's height. To operate the device correctly, the 90-degree step will have to be on a horizontal plane with the center of the joint in degrees, with the patient observing his own progress from day to day, and it permits exercise in any one of the planes of a sphere. It can be tilted and adjusted in every direction desired.

* Reprinted with permission, Bull. U. S. Army Med. Dept. 86:29 (March) 1945.

ARCHIVES of PHYSICAL MEDICINE
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EDITORIALS

MILEPOSTS IN THE PROGRESS OF PHYSICAL MEDICINE

There have been several significant events in the progress of physical medicine during the past twenty-five years but none transcends in importance three major developments: (1) The founding of the American Congress of Physical Medicine in 1920; (2) The action of the House of Delegates of the American Medical Association, May 25 to 29, 1925 authorizing the establishment of the Council on Physical Therapy (now Council on Physical Medicine); and (3) The announcement of Mr. Bernard M. Baruch on October 13, 1943 of the appointment of a committee of qualified medical men to make a survey of the field of physical medicine in the United States.

The foresight of the founders of the American Congress of Physical Medicine, when they launched the organization twenty-five years ago, has been fully demonstrated by subsequent developments. No branch of medicine has shown more spectacular growth and expansion. The Congress has increased in size and has exerted a most potent influence on the progress of physical medicine both at home and abroad.

By the establishment of the Council on Physical Medicine, the American Medical Association signified its recognition of the growing importance of the physical procedures in the field of therapeutics. The excellent service of the Council, during the twenty years of its existence, to the medical profession and to the public is well known and needs no recapitulation. Another contribution made by the American Medical Association, however, should be mentioned in passing. Through the Council on Medical Education and Hospitals, it has assisted greatly in raising educational standards for physical therapy technicians by its inspection and approval of physical therapy schools.

In April, 1944, after several months spent in collecting data, the Baruch Committee on Physical Medicine issued its comprehensive survey report. On the basis of this survey, the Committee set up six immediate objectives: (1) Organization of a central office; (2) Establishment of teaching and research centers in physical medicine at interested medical schools; (3) Establishment of fellowships and residencies in physical medicine; (4) Promotion of teaching and research in physical medicine in all approved medical schools; (5) Preparation of reports by the Committee; (6) Promotion of wartime and postwar physical rehabilitation.

There has recently appeared on the editor's desk the first "Annual Report of the Baruch Committee on Physical Medicine for the Fiscal Year, April 1, 1944 to March 31, 1945." Careful perusal of this report indicates that extremely satisfactory progress has been made toward the realization of the objectives already mentioned. Dr. Frank H. Krusen, Director, in summarizing the work of the Committee for the year said, "A review of the six recommendations of the original Survey Committee together with the foregoing appended comment indicates that during the first year of activity the Committee has been successful in completing all of the recommendations which were made and in inaugurating the program in its entirety."

In this issue of the ARCHIVES will be found a summary just released of the activities and accomplishments of the Baruch Committee on Physical Medicine during its first year of operation. The Committee is to be congratulated on being able to achieve so much during a year when the whole attention and intensive effort of the nation were directed toward winning the war.

EQUIPMENT

The writer is often asked, "Doctor, what kind of physical therapy equipment would you advise me to buy for use in my office." The questioner may desire advice on the particular make of diathermy apparatus or ultraviolet lamp to purchase, or, he may have in mind the more or less complete outfitting of his office. The answer is not always what the enquirer expects, since it is well known that a great deal of the apparatus purchased by physicians in the past has simply gathered dust and has proved a poor investment. The fault, however, commonly lies, not in the equipment, but in the doctor himself.

The first requisite to the successful practice of physical medicine by specialist and general practitioner alike is a knowledge of the fundamental physiologic basis, the clinical indications and the technic of the physical procedures. Relatively few of our medical schools have given their students adequate instruction in physical medicine and some have given no formal courses at all. Fortunately, this situation is being changed by the agencies mentioned in the previous editorial. Now, residencies, fellowships and graduate courses are becoming available. In recent issues of the ARCHIVES may be found information concerning graduate courses ranging in length from three days to six months. The physician who desires to make use of physical therapy in the care of his patients should most certainly become as well informed on the subject as his time will permit.

The second requirement for the successful use of physical therapy in the physician's practice is the employment of a registered physical therapy technician. Registration indicates that the technician has had sufficient training to pass the qualifying examination given by the American Registry of Physical Therapy Technicians. For the physician whose practice may not seem to warrant the employment of a full time physical therapy technician, a nurse, who has taken the physical therapy course in an approved school and has procured registration, may serve as office nurse and technician. Such an arrangement ordinarily will not last long, because the demand for physical therapy will soon monopolize the technician's full time if the physician himself knows the indications for the physical procedures.

We now get back to our original question concerning physical equipment. A qualified technician can give a great deal of effective physical therapy with relatively simple apparatus. When the physician has done graduate work in the field of physical medicine, he will usually be able to decide for himself what equipment he needs to meet the demands of his particular practice. The best advice which can be given him is that he purchase apparatus which bears the stamp of approval of the Council on Physical Medicine of the American Medical Association. He can be assured that such apparatus has been physically and physiologically tested and will give the maximum of safe satisfactory service.

MEDICAL NEWS

Drs. Solomon and Wyman Out of Service

The Editorial Staff welcomes back to civilian life and to work on our staff Walter M. Solomon. Dr. Solomon spent approximately three years in the Pacific theater in the services of the Army Medical Department. He has resumed private practice in Cleveland, Ohio.

The central office has also received word that Dr. John F. Wyman has returned to civilian life and will resume his position as director of physical medicine at the Sacred Heart Sanitarium, Milwaukee. Dr. Wyman advanced to the rank of Commander in the services of the United States Navy.

The New York Society of Physical Medicine

The New York Society of Physical Medicine held its annual meeting Jan. 9, 1946 at which Dr. H. J. Behrend presented a paper on "Physical Therapy in Geriatrics," which was followed by general discussion.

The executive session followed with memorials to deceased Fellows: Dr. A. Bern Hirsh, Dr. Frederick E. Bauer, Dr. Elizabeth Wright, Dr. H. J. Rubenstein and Dr. Harry Levant.

The loss of these members is a great blow to Physical Medicine. They were all pioneers in early days as Drs. Hirsh, Bauer and Wright or pioneers in new methods as Drs. Levant and Rubenstein. They all had that first requisite of the good practitioner of Physical Medicine, a sound medical foundation and broad clinical experience on which to base the science of Physical Medicine and the art of Physical Therapy.

A letter was read from Dr. Edward Titus who is confined at St. Luke's Hospital where he is recovering from a fracture of the femur. He extends thanks to his friends and colleagues and looks forward to resuming work in early spring.

Reports were given by the treasurer, secretary, president and the nominating committee.

The following officers were elected: President, Karl Harpuder; Vice-President, Charles G. Buckmaster; Treasurer, Richard Kovács; Secretary, Madge C. L. McGuinness. Excutive Committee: Dr. Harold Neifeld, Dr. William Bierman, Dr. Edward F. Hartung, Dr. Michael J. O'Connor and Dr. Jerome Weiss.

A collation followed and new and old friends visited together happily.

The services were represented by Lt. Col. Charles R. Brooke, in charge of Physical Medicine in the Veterans Administration, Washington, D. C., Lt. Col. Norman E. Titus now from the Veterans Administration Hospital, St. Louis, Missouri; Lt. Com. Nathan Goldstein, St. Alban's Naval Hospital, St. Alban's, N. Y. and Major Harry Kessler, Veterans Administration, New York.

There are still fifteen members of the Society in Service. Everyone expressed his happiness and satisfaction at being present and looked forward to another successful year.

Madge C. L. McGuinness, M.D., Secretary.

Praise for Dr. Hibben

The Pasadena-Alhambra Branch of the Los Angeles County Medical Society presented its retiring president, Dr. John Severy Hibben with a commemorative gavel in token of esteem and appreciation. Dr. Ross, program chairman, who made the presentation said, in his tribute, "It is my pleasure to say that Dr. Hibben, the retiring president, is the man who has spark-plugged this Pasadena-Alhambra branch into being the most active medical society in this part of the state. He has been an untiring worker, a dynamo of energy. No one could have made a greater contribution to his work."

Dr. Hibben is a past president of the American Congress of Physical Medicine and is a member of its Executive Council.

Series of Articles on Physical Therapy

"The New Enlarged Interne" including "The Scientific Supplement" appeared in January, 1946. Dr. Richard Kovács will be the editor of the Section on Physical Medicine. Dr. Frank H. Ewerhardt will be the Associate Editor of the section on Physical Medicine. We are informed that a series of 12 articles on physical therapy will be published.

Dr. Feaster Becomes President County Medical Society

Dr. Annette M. B. Feaster, a member of the Congress from St. Petersburg, Florida was recently elected president of the Pinellas County Medical Society and becomes the first woman to hold this office.

Physicians Needed for Veterans Administration

Qualified Physicians in physical medicine are urgently needed by the Veterans Administration and those who are qualified and can be certified by the Board, are entitled to a twenty-five per cent increase in pay up to eleven thousand dollars. The Veterans Administration has a number of openings at the present time in several of their large general medical surgical hospitals.

It is hoped also to have internships and residencies approved in the very near future in those hospitals which are to be connected with medical centers and schools.

Society of Physical Medicine

President — Fred B. Moor, M.D., Los Angeles.
President-Elect — William D. Paul, M.D., Iowa City, Ia.
Vice-President — Earl C. Elkins, M.D., Rochester, Minn.
Secretary-Treasurer — Milton G. Schmitt, M.D., Chicago.

Membership Committee — Nathan H. Polmer, M.D., New Orleans; Miland E. Knapp, M.D., Minneapolis; Madge C. L. McGuinness, M.D., New York; Arthur L. Watkins, M.D., Boston; Robert L. Bennett, M.D., Warm Springs, Ga.

Program Committee — Albert A. Martucci, M. D., Philadelphia; Robert L. Bennett, M.D., Warm Springs, Ga.; Frank H. Krusen, M.D., Rochester, Minn.

Grant to University of Toronto

A grant of $4,538 to the University of Toronto from the National Foundation for Infantile Paralysis to continue research on the atrophy of denervated muscle has been announced jointly by the National Foundation and Rev. Henry J. Cody, Chancellor of the university.

The grant, supplementing $21,166 previously given to the university for the same purpose, is one of 25 totaling $565,547 recently approved by the National Foundation's board of trustees.

The University of Toronto research project is conducted in the department of physiologic hygiene under the direction of Dr. D. Y. Solandt, acting head of the department.

Previous study under the same supervision and auspices has investigated the biophysical aspects of muscle atrophy, fibrillation and changes in electrical and chemical excitability. Future research under the grant will emphasize the interrelation of these phenomena and possible methods of modifying them.

Brucellosis

The National Society for Crippled Children and Adults, Inc., announces the publication of "Crippler in Disguise. The 20 Million Dollar Story of Brucellosis in America," Alice C. Evans and T. Arthur Turner. There is a foreword by Charles Armstrong, M.D., Chief, Division of Infectious Diseases, National Institute of Health, United States Public Health Service.

Mrs. Kahmann Cited for Meritorious Service

From the Office of the Surgeon General Mrs. Winifred C. Kahmann has received the following Commendation for Meritorious Civilian Service: "As technical advisor to the Surgeon General on all matters pertaining to Occupational Therapy, and with comprehension of emergency needs and vision with respect to long-range requirements, Winifred C. Kahmann has participated in the organization and direction of occupational therapy in the Army, preserving the highest professional standards in selecting and training therapists and in establishing the therapy and training programs designed to hasten the recovery of individual patients—a valuable contribution to the mission of the Medical Department of the United States Army."

Major General George F. Lull

After thirty-three years of active service in the U. S. Army, Major General George F. Lull voluntarily retired on Jan. 1 and has accepted an executive position at the headquarters of the American Medical Association at 535 North Dearborn Street, Chicago, Illinois. He was promoted to brigadier general (temporary) in March, 1943 and to major general (temporary) in the same year, in which he was assigned as Deputy Surgeon General.

General Lull has served as director, Department of Preventive Medicine, Army Medical School and Director of the Occupational Therapy Department, at Walter Reed General Hospital; on special duty as medical adviser to the Governor General of the Philippine Islands, at Manila; as chief of the Statistical Division in the Surgeon General's Office; commanding officer of the First Medical Regiment; and later director of the Department of Military Sanitation at the Medical Field Service School, Carlisle Barracks, from where he returned to the Surgeon General's Office as chief of Military Personnel.

Educational Field Secretary

Miss Henrietta McNary has now taken up offices in New York City to carry on further the program as educational field secretary of the American Occupational Therapy Association. Miss McNary started the first of her field trips in December.

New Clinic for Children With Cerebral Palsy

A newly created clinic for children suffering from cerebral palsy has been established at Strong Memorial Hospital in cooperation with the orthopedic and pediatric departments of the hospital and the University of Rochester School of Medicine and Dentistry cooperating. Ten hospital beds will be set up. Physical examinations in the clinic will be coupled with psychiatric tests, and home treatment will be outlined for ambulatory patients. Those needing hospital treatment will be brought into the new hospital division and when able will be moved to the Convalescent Hospital for Children on Beach Avenue. Arrangement have been completed for financial aid to parents unable to meet the cost of hospitalization or treatment.

Industrial Physicians to Meet in Chicago

A joint conference will be held in Chicago, April 8 to 13 by the American Association of Industrial Physicians and Surgeons, the American Industrial Hygiene Association, the National Conference of Governmental Industrial Hygienists, the American Association of Industrial Nurses and the American Association of Industrial Dentists.

Meeting of Interstate Postgraduate Medical Association

The next international assembly of the Interstate Postgraduate Medical Association of North America will be held at the Cleveland Public Auditorium, October 15, 16 ,17 and 18.

Special Society Elections

At a recent three day meeting in Paris, the first since 1938, Mr. Basil O'Connor, chairman, American Red Cross, was elected chairman of the board of governors of the League of Red Cross Societies.

Dr. William S. McEllroy, Pittsburgh, was chosen president-elect of the Association of American Medical Colleges during its annual meeting in Pittsburgh. Dr. John W. Moore, Louisville, was installed as president. Other officers included Joseph C. Hinsey, Ph.D., New York, vice-president; Dr. Fred C. Zapffe, Chicago, Secretary, and Dr. Arthur C. Bachmeyer, Chicago, treasurer.

John Caughey Appointed Dean

Dr. John L. Caughey, Jr., New York, has been named assistant dean at Western Reserve University School of Medicine, Cleveland, a newly created position.

Donald Welsh Gudakunst

Dr. Donald Welsh Gudakunst, Medical Director of The National Foundation for Infantile Paralysis, who died of a heart attack in his room at the Blackstone Hotel, Chicago, Sunday, January 20, had a long record in medicine and public health and was one of the country's leading authorities on poliomyelitis.

He joined the National Foundation, January 1, 1940, and was in charge of the organization's rapidly expanding program of research in infantile paralysis and care and treatment of patients.

Prior to joining the National Foundation, Dr. Gudakunst spent several years in public health work, chiefly in Michigan. He was Deputy Health Commissioner of Detroit from 1924 to 1937 and Michigan State Health Commissioner, 1938 and 1939. From 1937 to 1942, he was non-resident Professor of Preventive Medicine and Public Health, University of Michigan.

Dr. Gudakunst was born at Paulding, Ohio, August 18, 1894, the son of William Edward and Fannie May Welsh Gudakunst. He attended Latin High School, Somerville, Mass., and the University of Michigan, graduating as Bachelor of Science in 1917 and as Doctor of Medicine in 1919. His interneship was spent at the University of Michigan Hospital.

He is survived by his wife, Bernice Drahner Gudakunst, and a daughter, Mrs. Howard A. Vernon of Chicago. He lived on North Street, Westport, Conn.

Dr. Gudakunst was a fellow of the American Public Health Association, the New York Academy of Medicine and the American Medical Association and a member of Alpha Kappa Kappa and Delta Omega fraternities. He was a frequent contributor to medical journals.

At the time of his death, Dr. Gudakunst was talking in his hotel room with Commander Robert S. Schwab, formerly director of a research project at the Massachusetts General Hospital financed by the National Foundation.

FINANCIAL REPORTS

Report on Examination for Year Ended December 31, 1944

July 10, 1945.

American Congress of Physical Medicine,
30 North Michigan Avenue,
Chicago, Illinois.

Dear Sirs:

We have examined the balance sheet of the American Congress of Physical Medicine (formerly the American Congress of Physical Therapy, the name having been changed on September 28, 1944) as of December 31, 1944, and the summary of net income and surplus for the year ended that date, have reviewed the accounting procedures of the Congress and, without making a detailed audit of the transactions, have examined or tested accounting records of the Congress and other supporting evidence by methods and to the extent we deemed appropriate, except as stated in the following paragraph.

In an organization of this size it is not practical to maintain the accounting staff which would be required to insure complete control over the sources of income. We tested the correctness of the income recorded on the books by reference to available supporting details, but we did not make the complete verification of the income accounts which would be required in order to certify to the correctness thereof without qualification.

The space, personnel, and facilities of the general office of the American Congress of Physical Medicine are also used by the American Registry of Physical Therapy Technicians, an affiliated organization. It has been the practice of the Congress to pay the general office expenses and to charge the Registry for a portion thereof, based, in general, on the activities of the two organizations.

During the year ended December 31, 1944, the American Congress of Physical Medicine billed prorated expenses to the American Registry of Physical Therapy Technicians in the aggregate amount of $4,464.18. In the preceding year prorated expenses billed to the Registry totaled $2,421.16.

In our opinion, subject to the foregoing, the accompanying balance sheet and summary of net income and surplus fairly present, in conformity with generally accepted principles of accounting applied on a basis consistent with that of the preceding year, the financial position of the Congress at December 31, 1944, and the result of its operations for the year ended that date.

We submit the following exhibits and schedules:

Exhibit —

A — Balance Sheet, December 31, 1944.

Schedule —

1 — Accounts Receivable — Advertisers and Exhibitors.

2 — Accounts Payable — Trade Creditors.

B — Summary of Net Income and Surplus for the Year Ended December 31, 1944.

Schedule —

1 — Direct Convention Expenses.

Yours truly,
GEORGE ROSSETTER & CO.

Exhibit A

American Congress of Physical Medicine
(Formerly American Congress of Physical Therapy)
Balance Sheet, December 31, 1944

Assets

Current Assets:		
Cash in bank and on hand		$13,479.80
Accounts receivable:		
Advertisers and exhibitors—Schedule 1	$ 597.25	
Members' dues	1,596.00	
American Registry of Physical Therapy Technicians	1,603.48	
Society of Physical Therapy Physicians	44.71	
Total	$3,841.44	
Less reserve for doubtful accounts	200.00	
Accounts receivable — net		3,641.44
Mailing deposit		40.60
Total		$17,161.84

Liabilities

Current Liabilities:		
Accounts payable:		
Trade creditors—Schedule 2	$ 612.96	
New York Society of Physical Medicine	5.00	
Total accounts payable		$ 617.96
Federal income tax withheld from employees		223.28
Sundry deposits		50.59
Total current liabilities		$ 891.83
Deferred Income:		
Subscriptions to "Archives" Unexpired portion	$3,141.94	
Members' 1945 dues billed or paid in advance	3,086.00	
Total deferred income		6,227.94
Surplus, per Exhibit B		10,042.07
Total		$17,161.84

Exhibit B

American Congress of Physical Medicine
Summary of Net Income and Surplus for the Year Ended December 31, 1944

Income:		
Members' dues		$3,812.50
"Archives":		
Advertising		5,134.23
Subscriptions		5,928.62
Sale of cuts, etc.		201.84
Convention income:		
Exhibits	$2,229.00	
Special instruction course	1,124.00	
Total	$3,353.00	
Direct convention expenses	1,916.61	
Convention income — net		1,436.39
Miscellaneous income		51.51
Total income		$16,565.09
Expenses:		
Office salaries and office expense	$3,417.22	
Printing expense — "Archives"	6,475.43	
Cuts, half-tones, electros, etc.	636.92	
Sectional meeting	167.09	
Accounting and legal fees	306.20	
Provision for doubtful accounts	268.00	
Miscellaneous	190.33	
Share of office expense billed to Society of Physical Medicine (credit*)	120.00*	
Total expenses		11,341.19
Net Income for the Year		$ 5,223.90
Surplus at Beginning of the Year		4,818.17
Surplus at End of the Year		$10,042.07

Report on Examination for Year Ended December 31, 1944

July 11, 1945.

American Registry of Physical Therapy Technicians,
30 North Michigan Avenue,
Chicago, Illinois.

Dear Sirs:

We have examined the balance sheet of the American Registry of Physical Therapy Technicians as of December 31, 1944, and the statement of net income and surplus for the year ended that date, have reviewed the accounting procedures of the Registry and, without making a detailed audit of the transactions, have examined or tested accounting records of the Registry and other supporting evidence by methods and to the extent we deemed appropriate, except as stated in the following paragraph.

In an organization of this size it is not practical to maintain the accounting staff which would be required to insure complete control over the sources of income. We tested the correctness of the income recorded on the books by reference to available supporting details, but we did not make the complete verification of the income accounts which would be required in order to certify to the correctness thereof without qualification.

The space, personnel, and facilities of the general office of the American Congress of Physical Medicine, an affiliated organization, are used by the American Registry of Physical Therapy Technicians. It has been the practice of the American Congress of Physical Medicine to pay the general office expenses and to charge the Registry for a portion thereof based, in general, on the activities of the two organizations.

During the year ended December 31, 1944, the American Congress of Physical Medicine billed the Registry for prorated expenses in the aggregate amount of $4,464.18. In the preceding year, prorated expenses billed to the Registry aggregated $2,421.16.

Dues are recorded as received by the Registry, and the accompanying balance sheet does not include dues billed, but uncollected at December 31, 1944.

In our opinion, the accompanying balance sheet and statement of net income and surplus fairly present, in conformity with generally accepted principles of accounting applied on a basis consistent with that of the preceding year, the financial position of the Registry at December 31, 1944, and the results of its operations for the year ended that date.

Prior to January 1, 1940, the transactions of the Registry were recorded on the books of the American Congress of Physical Therapy, predecessor by change of name on September 28, 1944, to the American Congress of Physical Medicine.

We submit the following exhibits:

Exhibit —

A — Balance Sheet, December 31, 1944.

B — Statement of Net Income and Surplus for Year Ended December 31, 1944.

Yours truly,
GEORGE ROSSETTER & CO.

Exhibit A

American Registry of Physical Therapy Technicians
(Incorporated in Illinois — Not for Profit)
Balance Sheet, December 31, 1944

Assets

Current Assets:		
Cash on deposit with the National Boulevard Bank of Chicago	$7,355.24	
Investment in United States Savings Bonds, Series G (at cost)	3,000.00	
Accrued interest earned	32.25	
Total		$10,387.49

Liabilities

Current Liabilities:		
Accounts payable:		
American Congress of Physical Medicine	$1,603.48	
Trade	10.65	
Total accounts payable	$1,614.13	
Pin deposits	24.50	
Accrued federal excise tax	1.45	
Total current liabilities		$ 1,640.08
Deferred Income:		
Dues collected in advance — year 1945	$2,246.00	
Deposits with applications (subject to refund if applications are rejected)	60.00	
Total deferred income		2,306.00
Surplus, per Exhibit B		6,441.41
Total		$10,387.49

Exhibit B

American Registry of Physical Therapy Technicians
Statement of Net Income and Surplus for the Year Ended December 31, 1944

Income:		
Dues	$2,916.00	
Registration fees	5,660.00	
Sales:		
Pins	402.50	
Emblems	94.40	
Directory	43.20	
Miscellaneous	70.60	
Total income		$9,186.70
Expenses:		
Office salaries and office expenses	$5,964.26	
Examinations — supervision and marking	363.97	
Exhibits	12.00	
Accounting and legal	235.10	
Purchase of pins	296.01	
Bond premium	25.00	
Directory	41.25	
Traveling	73.41	
Miscellaneous	148.56	
Total expenses		7,159.56
Net Income for the Year		$2,027.14
Surplus at Beginning of the Year		4,414.27
Surplus at End of the Year		$6,441.41

BOOK REVIEWS

GALEN ON MEDICAL EXPERIENCE. By *R. Walzer.* First Edition of the Arabic version with English translation and Notes. Published for the trustees of the late Sir Henry Wellcome. Cloth. Price, $4.00. Pp. 164. New York, London and Toronto: Oxford University Press, 1944.

Galen (131-200 A. D.) was the greatest Greek physician after Hippocrates. The founder of experimental physiology was born an architect's son at Pergamus. At Rome, where he commenced practice in 164 A. D., he soon attained the leadership in his profession.

Galen's treatise on Medical Experience was written at Pergamus before the year 150 A. D., the young author having not completed his twenty-first year. The publication of this Arabic version restores to medical science a work hitherto lost, except for two small fragments of the original Greek test.

The original text has been lost, and the earliest version at present known is that which is now published from the ninth century Arabic translation discovered at Constantinople by Dr. H. Ritter in 1931. The translated title states: "Galen's Treatise on Medical Experience, translation by Hunian from Greek into Syriac and translation by Hubaish from Syriac into Arabic." Hubaish was the nephew and eminent disciple of Hunian ibn Ishāq who was in his day, as he himself records, the translator into Syriac of the lost Greek version. Since Hunian's translation was written for the Christian physician Botisho ihn Gibril whose friendship was to change into bitter hostility between the years A. D. 850 to 856 it may be concluded that this Syriac translation was concluded before 850 A. D. The Arabic translation can only have been finished and published after 863 A. D., because in that year the second compilation of Hunian's aforementioned treatise appeared but made no reference to it.

As only a single Greek work on the empirical medicine of Antiquity has previously been traced (namely a Latin version of Galen), the new text has a considerable bearing on our knowledge of this medical school. It is also of importance for the history of Sceptic Philosophy and contains a new fragment of Demokritos. The Arabic version gives fresh proof of the wonderful command of the style and language of Greek learning which characterizes the Nestorian translators of the ninth century A. D. The English translation has been revised in conjunction with Professor Gibb of Oxford.

As Galen himself clearly points out in his introduction, it is an introductory treatise intended for beginners as an aid to the understanding of a treatise that he had already written.

NEW AND NONOFFICIAL REMEDIES, 1945; CONTAINING DESCRIPTIONS OF THE ARTICLES WHICH STAND ACCEPTED BY THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION ON JANUARY 1, 1945. Issued Under the Direction and Supervision of the Council on Pharmacy and Chemistry of the American Medical Association. Cloth. Price, $1.50. Pp. 760. Chicago: American Medical Association, 1945.

As stated in the preface, the entire book has been scanned to bring it up to date with the latest medical knowledge. In this volume the physician may find the best and most useful of the newer pharmaceutic agents. If a new or not yet official drug is not here described, the physician should hesitate to use it without finding out why it does not appear. If the agent was formerly described in the book and does not appear, the Council considers that it has not fulfilled its promise of usefulness. A number of new preparations appear. Many articles appearing in the 1944 edition have been omitted as being off the market. It is of vital importance for physicians to keep their files up to date on the information available in these yearly revisions.

MANUAL OF DIAGNOSIS AND MANAGEMENT OF PERIPHERAL NERVE INJURIES. By *Robert A. Groff,* M.D., Lt. Colonel, M.C., A.U.S.; formerly Assistant Professor of Surgery, Jefferson Medical College and Assistant Professor of Neurosurgery, Graduate School of Medicine, University of Pennsylvania and *Sara Jane Houtz,* B.S., First Lieutenant (P.T.), A.U.S. With an Introduction by *I. S. Ravdin,* M.D., Brigadier General, M.C., A.U.S.; John Rhea Barton, Professor of Surgery, University of Pennsylvania. Pp. 118 with 111 original illustrations. Cloth. Price, $8.00. Philadelphia: J. B. Lippincott Co., 1945.

This concisely written and profusely illustrated manual, born amidst the vicissitudes of jungle war on the Burma border, should be highly welcomed by physicians and physical therapy technicians. It is divided into two parts. Part one is devoted to a general discussion of nerve injuries. The various types of lesions are described and relevant anatomic and physiologic data for their recognition are presented. A plan is given for investigation of an injury to a nerve and treatment is fully discussed from the standpoint of surgery as well as of physical therapy. The authors recognize the importance of all forms of physical therapy except electrical stimulation; they take no cognizance of extensive newer experimental evidence in its favor. Part two offers an illustrated outline of peripheral

and cranial nerve function. Muscle function diagrams are a special feature of this section. They serve for rapid visualization of the action of a particular muscle, as well as furnishing a guide for the administration of specific muscle exercises. These illustrations are excellent and the accompanying legends clear and concise. At the end of this section are anatomic drawings showing nerve relationships in crucial parts of the extremities. This monograph is indeed an excellent product of the war effort and serves as an outstanding example of the splendid background and of the painstaking work that many professional men and women of the U. S. Army Medical Department have carried on. Physicians and technicians treating nerve injuries will find in this volume an invaluable aid in their daily routine.

THE STRUCTURE AND FUNCTION OF THE HUMAN BODY. By *Ralph N. Baillie,* Ph.D., and *Donald L. Kimmel,* Ph.D. Cloth. Pp. 328. Price, $3.00. Philadelphia, Pa.: J. B. Lippincott Company, 1945.

This is a concise, carefully organized presentation of the basic relation of bodily structure and function. It is not intended for the advanced student in anatomy, or physiology. It has insufficient detail to act as a reference book. It is, however, a fine introductory text for the student of biology or can be used to great advantage by the student in physical therapy, occupational therapy and nursing. It emphasizes proven basic principles and illustrates the principles with sufficient detail to make interesting reading.

CHARACTER ANALYSIS: PRINCIPLES AND TECHNIQUE FOR PSYCHOANALYSTS IN PRACTICE AND IN TRAINING. By *Wilhelm Reich,* M.D., Translated by *Theodore P. Wolfe,* M.D. Second edition. Pp. 328. Cloth. Price, $4.50. New York: Orgone Institute Press, M.D., 1945.

Psychoanalytic "science" based on the original conceptions of Freud looks for new horizons in this volume, which is a translation of the original volume published in German in 1933 and enlarged by another translation, that of a newer monograph entitled "Psychic Contact and Vegetative currents." It is written chiefly for those thoroughly familiar with psychonanalysis or aiming toward that goal; hence its vocabulary and its presentation may considerably puzzle the average physician. Character analysis as described in this volume is essential in the frame-work of "depth-psychological thinking" and for the psychotherapeutic technics which correspond to it. There are two main parts in the volume: I. Technique; contains as its principal chapters: Some problems of psychonanalytical technique; the Economic viewpoint in the theory of analytic therapy; on the technique of interpretation and of resistance analysis; on the technique of character analysis; Indications and dangers of character analysis; on the handling of transference. Part II: Theory of character formation, contains as chapter headings: The characterological mastery of the infantile sexual conflict; The genital character and the neurotic character, The sex-economic function of the character; Infantile phobia and character formation; Some circumscribed character forms; A Note on the basic conflict between Nedd and the Outer World. The author declares, that as a result of developments over the past decade, the "sex-economist" and vegetotherapist of today is essentially a "biotherapist" and no longer merely a psychotherapist.

A PRIMER OF ELECTROCARDIOGRAPHY. By *George Burch,* M.D., F.A.C.P., Associate Professor of Medicine, Tulane University School of Medicine; Senior Visiting Physician, Charity Hospital; Consultant in Cardiovascular Diseases, Ochsner Clinic; Visiting Physician, Touro Infirmary, New Orleans and *Travis Winsor,* M.D., Instructor in Medicine, Tulane University School of Medicine; Assistant Visiting Physician, Charity Hospital, New Orleans. Cloth. Price, $3.50. Pp. 215, with 235 engravings. Philadelphia: Lea & Febiger, 1945.

This book is intended as an introduction to the subject and as such sets forth merely the basic principles involved and their use in the interpretation of the more frequent disorders of the heart. The theories are described briefly and satisfactorily, the authors having intentionally omitted many of the controversial opinions. The section describing the various components of the electrocardiogram is excellent both as to the text and by the use of large clear diagrams. The use of the large diagrams and the accompanying graphic representation of the cardiac lesions which they show is an unusually fine feature. This volume is recommended as a concise and easily understood discussion of electrocardiography.

A TEXT-BOOK OF NEURO-ANATOMY. By *Albert Kuntz,* Ph.D., M.D., Professor of Micro-Anatomy in St. Louis University School of Medicine, St. Louis, Missouri. Cloth. Pp. 478, illustrated with 325 engravings. Price, $6.50. Philadelphia: Lea & Febiger, 1945.

In this edition the text has been thoroughly revised and parts of it have been rewritten. New data have been incorporated. Many of the illustrations have been replaced by new ones of greater clearness and some additional ones have been introduced.

The material is arranged to give the student an adequate concept of nervous system as a whole early in the course and then to acquaint him with the simpler reflex and correlation mechanism in the spinal cord and brain stem before taking up the long conduction pathways in their entirety and the higher subcortical and cortical mechanisms. The conduction pathways are studied from the point of view of their specific functions, i. e., every central pathway is considered in its functional relation to peripheral neurons and to any other central pathways which may be involved in the conduction of impulses to or from the highest center with which the pathway in question is functionally associated. The diencephalon, the corpus striatum and the cerebral cortex are dis-

cussed mainly from the viewpoint of their phylogenetic development and anatomical and functional relationship as indicated by the results of the more recent anatomical, physiologic, experimental and clinical studies. The autonomic nervous system is treated in a chapter based on the author's book, "The Autonomic Nervous System." An outline for laboratory study is included which is so arranged that it may be used in whole or in part.

The understanding of human behavior, adjustments of the body as a whole or its parts to factors in its external and internal environment and the regulation of vital processes through neural mechanisms, like the intelligent diagnosis and localization of neural disturbances, depends on the accurate knowledge of the anatomy and physiology of the nervous system. This book sets forth such knowledge in an orderly manner and without too great detail. It provides a comprehensive account of the anatomy of the human nervous system with sufficient physiologic data to link structure and function into a dynamic pattern.

ENDURANCE OF YOUNG MEN, ANALYSIS OF ENDURANCE AND METHODS OF EVALUATING MOTOR FITNESS. By *Thomas Kirk Cureton; Warren J. Huffman; Lyle Welser; Ramon W. Kireilis, and Darrell E. Latham* of the School of Education Staff, University of Illinois. Paper. Price, $2.50. Pp. 284. Published by Society for Research in Child Development, National Research Council, Washington, D. C., 1945.

This monograph is the report of a study on human endurance as measured by 28 exercises. A tremendous amount of data is given which statistically analyzes the results by numerical correlation. There are numerous tables, graphs and charts as well as illustrations demonstrating the exercises which were used in the study. The descriptive portions of the volume were often difficult to read and the conclusions following the various sections left much to be desired in clarification; however, this might well be pardoned in a detailed report such as this. The monograph should be of interest to instructors of physical education who should be impressed with the amount of work accomplished and the possibility of scientific research in their particular field.

FACIAL AND BODY PROSTHESIS. By *Carl Dame Clarke,* Ph.D., Associate Professor of Art as Applied to Medicine, School of Medicine, University of Maryland; Captain, Sanitary Corps, A. U. S., Dept. of Moulage and Prosthetics, Army Medical Museum. Cloth. Price, $5.00. Pp. 200. The C. V. Mosby Co., St. Louis. The C. V. Mosby Co., 1945.

This timely and practical volume is a mine of information for either practitioner or student of medicine or dentistry particularly those interested in plastic surgery or orthodontia. The book is very valuable in that it gives many small but important hints as "where to buy an item" or "how to make the item yourself."

THE 1945 YEAR BOOK OF PHYSICAL MEDICINE. Edited by *Richard Kovács,* M.D., Professor of Physical Medicine, New York Polyclinic Medical School and Hospital; Attending Physical Therapist, Manhattan State, Harlem Valley State, Columbus and West Side Hospitals; Visiting Physical Therapist, New York City Department of Correction Hospitals; Consulting Physical Therapist, New York Infirmary for Women and Children, Mary Immaculate Hospital, Jamaica, N. Y.; St. Charles Hospital, Port Jefferson, L. I., Hackensack Hospital, Hackensack, N. J., and Alexian Brothers Hospital, Elizabeth, N. J. Cloth. Pp. 400 with 106 illustrations. Price, $3.00. Chicago: The Year Book Publishers, Inc., 1946.

The end of World War II found the number of departments of physical therapy in the hospitals in the armed service and in rehabilitation centers at an all time high. The subsidies of the Baruch Committee on Physical Medicine and of the National Foundation of Infantile Paralysis have stimulated research and teaching in a number of medical schools. The return from the armed services and the entry into the field of physical medicine in civilian practice of many new and enthusiastic minds will bring forth desirable new developments in laboratory study and clinical application. For many years to come there will be extensive work to be done by physicians and physical therapy technicians in the rejuvenated Veterans Administration.

During 1945 a number of significant advances occurred in physical medicine. These Dr. Kovács has recorded. Since its first volume in 1938, the Year Book of Physical Medicine has been recognized as a book which physicians interested in this subject and physical therapy technicians and occupational therapists who are anxious to keep abreast of progress in physical medicine have needed. It is now considered by many in this field as a "must" book, since it presents a correlation of the best and latest in the fields of physical and occupational therapy.

The first part which is devoted to physical therapeutic methods gives much valuable information. Equally important is the second portion devoted to therapy, which occupies a little more than half of the book. In this section the author shows how a physician can follow one of the underlying principles of physical medicine. Kovács states: "In prescribing physical measures the physician should specify in writing the underlying pathologic condition, the effect desired from therapy, the type of treatment within the classification, e. g., whether superficial or deep massage and the duration and frequency of treatments. He should include revalent details such as status of heart and blood pressure when he is prescribing exercise."

It is impossible in so short a review to give an adequate idea of the useful contents of the book. Printed on excellent paper and using type that is clear and easy on the eye, the book is replete with clear, interesting and important illustrations. It is highly recommended.

PHYSICAL MEDICINE ABSTRACTS

Galvanic Tetanus and Galvanic Tetanus Ratio in Electrodiagnosis of Peripheral Nerve Lesions. Lewis J. Pollock; James G. Golseth, and Alex. J. Arieff.

Surg., Gynec. & Obst. 31:666 (Dec.) 1945.

Attention has been called by the authors to the importance of studying galvanic tetanus resulting from the passage of a strong galvanic current through a muscle apart from other changes in the character of the contraction of a muscle. Tetanus results when a galvanic current conveying stronger current than that necessary for liminal stimulus is used. It has been variously called "myotonic reaction," "galvanotonus," and "galvanic tetanization." Since it results from galvanic stimulation the authors propose that it be called "galvanic tetanus." As the absolute value of the threshold amperage for tetanus may be quite high when the rheobase is high because of changes in the tissues such as edema, etc., it is valuable to estimate the ratio between the threshold amperage for tetanus and the rheobase. This ratio has been variously called "polarization coefficient" and "contraction coefficient." Since it is the ratio between the threshold amperage of galvanic current for tetanus and the rheobase, the authors propose it be called the "galvanic tetanus ratio."

Since the contractions resulting from stimuli by progressive currents of long duration are tetanic and since, as is the case with galvanic tetanus ratio, the ratio of the threshold amperage for contraction from stimuli by progressive currents approaches or is at unity during denervation, it is our opinion that progressive currents resulted in the same prolonged excitation as occurred when a strong current was suddenly passed through muscle resulting in tetanus.

The characteristics of a denervated muscle have been shown to be a minimal threshold amperage for galvanic tetanus, a unity of the polar ratio and a tetanus ratio approaching or at unity, both for anodal and cathodal stimuli; those of regenerating muscles are a high threshold amperage for tetanus and a high, often unobtainable, tetanus ratio. When sufficient time has elapsed after injury or operation for denervation to have developed and a high threshold amperage for tetanus and a high tetanus ratio are found, the nerve is regenerating. On the other hand, when sufficient time has elapsed for recovery and a low threshold amperage for tetanus is present and the tetanus ratio approaches or is at unity, operative treatment is indicated.

In their conclusions the authors state that a moderately high threshold for galvanic tetanus and a high tetanus ratio characterize a degenerating nerve-muscle complex.

A minimal threshold for galvanic tetanus and a tetanus ratio approaching or at unity, both for anodal and cathodal stimuli, are characteristic of denervated muscle.

A high threshold for galvanic tetanus and a very high tetanus ratio are characteristic of a regenerating nerve-muscle complex.

These characteristics found in experimental studies in the cat have been confirmed by the authors in man.

Penicillin Combined With Fever Therapy. A Preliminary Report of Twenty Cases of Early Syphilis. Robert M. Craig; George X. Schwemlein, and H. Worley Kendell.

J. Lab. & Clin. Med. 30:1020 (Dec.) 1945.

Preliminary evidence is presented to demonstrate that penicillin and physically induced fever may be safely combined in the treatment of early syphilis as described. Penicillin-fever therapy as compared to arseno-bismuth-fever therapy was more comfortable for the patients. Blood penicillin activity during penicillin-fever therapy was variable before and during this form of therapy, while none was detected on the two consecutive mornings after fever therapy. The use of 600,000 units of penicillin plus three hours of fever at 106 F. (rectal) is inadequate treatment for early syphilis. The use of 1,200,000 units of penicillin plus three hours of fever at 106 F. (rectal) is encouraging enough to warrant further study of the use of penicillin-fever therapy in early syphilis.

Chronic Lumbar Backache. Clarence A. Splithoff.

Am. J. Surg. 71:25 (Jan.) 1946.

The treatment for chronic lumbar backache is outlined. It consists of general therapy: (a), general toning up; (b), lumbar belt; (c), corrective shoes and (d), see patient frequently. Physical therapy: (a), radiant heat; (b), massage and (c) exercise. Home therapy: (a), bed boards and mattress; (b), radiant heat or other forms and (c), exercises.

The weak back must not be considered a simple local problem, for many times there are general conditions which may prolong the disability. The question of adequate sleep in the prevention of fatigue, of the patient's working and living environment and of his general health, all must be considered. Some form of mild sedative or analgesic may be needed for a short period. A change of occupation or duty is sometimes also necessary.

In his conclusions the author states, that man, as a result of assuming the upright posture, has inherited a potentially weak structure, the lumbosacrum. This area is subject to anomalous

changes and is therefore not in equilibrium. This area may be easily overburdened by poor posture, obesity, asthenia and trauma such as slips or falls resulting in chronic low back disability. Every case should be carefully studied to rule out obvious causes of disability such as protruded intervertebral disc, infections, fracture, arthritis and anomalies. Those cases which remain can be treated with gratifying results by a program such as outlined in this paper.

Ultraviolet Lamps for Disinfecting Purposes. Present Status. W. W. Coblentz.

J. A. M. A. **129**:1167 (Dec. 22) 1945.

The results of this investigation, which extended over a period of six months (December to May) are impressive and instructive in showing that the incidence of respiratory illness in the barracks irradiated with low intensity ultraviolet lamps followed the same undulations that occurred in the adjacent control barracks, whereas in the barracks irradiated with a high intensity there was a definite reduction in the incidence of respiratory illness—a reduction estimated at 25 per cent for the entire period of observation of respiratory illness in the high intensity irradiated group as compared with the control group, "and not due to chance." Hence, while ultraviolet radiant disinfection of air can be substituted for actual air displacement in reducing cross infection in chickenpox, measles and mumps, and with less certainty in reducing the incidence of colds, there is no evidence that will justify high pressure sales promotion of ultraviolet disinfecting lamps as a cureall or sureshot preventive of respiratory illness. Disinfection by ultraviolet radiation can serve a useful purpose, but it has its limitations. In this connection it is a satisfaction to record that at least one manufacturer is issuing to its salesmen and distributors a printed guide setting forth factual information regarding ultraviolet disinfecting lamps and some of their shortcomings. Whether this is for self protection (because an "employer need not ask an employee to cheat for him," as the vice-president of one large lamp manufacturing concern once remarked, years ago) or for altruistic reasons, the booklet should serve a useful purpose in guiding overenthusiastic salesmen as well as the consumer.

Protective Skin Coatings for the Prevention of Sunburn. Matthew Luckiesh; A. H. Taylor; H. N. Cole, and Torald Sollmann.

J. A. M. A. **130**:6 (Jan. 5) 1946.

Most of the erythema resulting from exposure to natural sunlight and skylight is produced by ultraviolet energy shorter than wavelength 3,200.

The Army Air Forces desired an agent or agents as a prophylaxis of sunburn. This protective cream or ointment to be stowed in life rafts or military aircraft must have maximum protection per unit weight or volume. It must be stable to heat and cold, free from rancidity, lend itself to simple packing, be non-toxic and not wash off.

Experiments were carried out at the Lighting Research Laboratory, General Electric Company, Nela Park, Cleveland, to ascertain the safest, most practicable, most cohesive, nontoxic agent or agents to serve this purpose.

Dark red vet. petrolatum (Standard Oil Company of New Jersey) was found to be quite opaque to erythemal energy. It likewise served as a complete protection to the skin in an exposure equivalent to twenty hours of the strongest sunlight in Cleveland measured during a four year period. This product in itself is recommended for the protection of aviators marooned on life rafts or in the desert following airplane crashes. The compound is not irritating and adheres tenaciously to the skin.

Phenyl salicylate (salol) was also found to be an excellent protection from ultraviolet radiation when put up in a 10 per cent cream. Experiments have also shown it to be nontoxic. It is further felt that a 10 per cent phenyl salicylate incorporated in the dark red vet. petrolatum be also tried as a suitable agent for protection of marooned aviators.

The General Treatment of Arthritis. Loring T. Swaim.

J. Indiana M. A. **38**:489 (Dec.) 1945.

The first step in treating a hypertrophic joint is to rest it. In extreme cases it is beneficial to immobilize such a joint in a plaster cast for a week or more. After such a complete rest invariably the joint is painless and more movable; and as it is protected from further strain, the bony growth ceases.

Heat is always advisable in these cases, especially for older people whose circulation is poor because of arterial changes. Moist heat, if used regularly, stimulates sluggish circulation and relieves soreness and pain.

Diet does not seem to play an important part in curing degenerative joint disease, although in the case of overweight patients a diet low in carbohydrates and sweets is advisable.

Permanent relief from pain in the back, neck, hips and knees, however, comes principally from correction of faulty posture which causes the strain. This is done by special rest positions and exercises.

As a tired person always droops into poor posture, the same positions and exercises are prescribed for these rheumatoid cases as were used in the treatment of the osteoarthritics, but for a different reason. Their poor posture must not be allowed to interfere with normal functioning of the abdominal viscera through crowding.

Taken morning and evening, these exercises aid digestion and stimulate circulation through the abdomen. The flat hyper-extended position gives the heart, lungs and diaphragm their best chance to function. A little explanation will make this routine clear to the patient, and he will cooperate fully.

There is no specific diet that can be prescribed for rheumatoid arthritis, although we know certain facts which help in planning a balanced diet.

Dr. Ralph Pemberton has shown that many cases have low sugar tolerance; therefore, the diet should contain the minimum amount of sweets and carbohydrates.

The diet, therefore, should be well-balanced with protein, carbohydrates, and fats and should be rich in vitamins and minerals. Extra vitamins are indicated, as most of these cases have been deficient for a long time, and their tissues change slowly even with large doses of vitamins.

In many cases gastric analysis shows a lack of hydrochloric acid, which may be the cause of the failure to absorb iron and vitamins. This acid should be supplied when indicated.

The Action of Spectrum of Sensitization to Heat With Ultraviolet Light. Arthur C. Giese, and Elizabeth B. Crossman.

J. Gen. Physiol. 29:87 (Nov. 20) 1945.

According to the authors, heat does not sensitize paramecia to ultraviolet light but ultraviolet light sensitizes them to heat. Paramecia of two species (Paramecium caudatum and P. multimicronucleata) are much more readily killed by heat at 42.3 C. if they are first exposed to ultraviolet light. From studies on paramecia irradiated with a given dosage at various wavelengths before being killed by heat, an action spectrum of the compound in the protoplasm being sensitized to heat can be determined. Proteins with absorption similar to that of pseudoglobulin are suggested by these experiments. The effect on living things differs from that on pure protein systems in that paramecia are not rendered more sensitive to temperatures below the lethal temperature whereas proteins are. Almost complete recovery from ultraviolet light as judged by heat sensitivity occurs within four to five days. By a study of the rate of recovery from doses at different wavelengths evidence suggesting effects on nucleic acid is obtained. The possible significance of the data and the action spectrum is discussed.

Ultraviolet Radiation as a Germicidal Agent. E. H. Greppin.

Hosp. Management 59:116 (May) 1945.

The use of ultraviolet radiation as a germicidal agent is often somewhat misunderstood.

It has been definitely established that short wavelength radiation will kill bacteria which are exposed to a sufficient intensity of radiation for a sufficient length of time, and further, it is indicated that other bacteria which have not been exposed to sufficient radiation may have their reproductive capacity inhibited.

The most effective germicidal wavelength is in the region of 2560 angstroms. However, this wavelength is not easily obtained commercially and the germicidal lamps that are in use usually employ a wavelength of 2537 angstroms, which is approximately 90 per cent efficient in comparison to 2560 angstroms.

Ultraviolet light may be employed successfully for reducing the bacteria count in the air or other fluid or gaseous media which will transmit the ultraviolet light. However, complete or true sterilization is quite unlikely as it is improbable that all of the bacteria will be exposed to sufficient radiation, for bacteria will collect in clusters on a dust particle or water droplet, and only those bacteria on the outside of the cluster will be exposed to the full intensity of the radiation.

Attempts have been made to sterilize surfaces of such articles as instruments and utensils by ultraviolet light. These, however, have not proved successful, mainly because it's not practicable for the light to reach all surfaces. This type of radiation will not penetrate joints or crevasses nor be effective under particles of dirt or dust.

The use of ultraviolet in the sterilization of water is a study in itself, but it is probable that only a portion of the bacteria would be irradiated due to the bacteria forming in clusters. Also the transmission of the ultraviolet light through water would be materially affected by any turbidity of the water, or by scum which would collect on the ultraviolet tube over a period of time.

The use of germicidal ultraviolet light in the operating room has in some surgeries proved quite advantageous. However, the majority of surgeons object to the complete masking necessary to protect their skin and eyes from the irradiation which is usually projected downward over the table and throughout the entire room. The nurses also must be thoroughly protected from the irradiation. Many surgeons feel that equally satisfactory results can be obtained through other precautionary methods.

There has been some work done with the use of ultraviolet lights over instrument tables. This would seem a logically sound use.

In 1942 the American Association for the Advancement of Science published a book entitled "Aerobiology." This book is a group of papers on that subject and there are many excellent articles on the use of germicidal ultraviolet light under various conditions.

Fluorescein—Its Use in Determining the Viability of Strangulated Intestine. C. Alexander Hatfield; Robert A. Buyers, and Adolph A. Walkling.

Surg., Gynec. & Obst. 81:532 (Nov.) 1945.

Five cases are reported in which fluorescein has been injected intravenously and an ultraviolet lamp with a Wood's filter was used to determine fluorescence in damaged bowel. The presence of fluorescence was sufficient evidence of viability to permit return of these damaged loops of bowel to the abdominal cavity. The absence of fluorescence was diagnostic of nonviability confirmed by microscopic section.

Postoperative course and pathologic sections seem to bear out the prognosis based on the fluorescein method.

There seems to be adequate evidence that this relatively simple method removes the uncertainty from a diagnosis which never has been classified as exact.

Acute Brachial Radiculitis. Course and Prognosis. G. Joly Dixon.

Lancet **2**:108 (Dec. 1) 1945.

The article is based on a detailed study, over about two years, of 16 typical cases of acute brachial radiculitis. These cases all conform to the syndrome described by Spillane (1943), invariably starting with some pain in the root of the neck and shoulder region. Usually the pain is severe and often it complicates the course of an acute infectious fever or the convalescence from a surgical operation. Palsy is often not noticed for several days, in fact not until the pain begins to abate; then the patient usually finds he is unable to lift his arm. Muscular wasting follows close on the heels of the palsy and is usually extensive at the end of 14 days. An area of sensory loss, although not complained of by the patient, is usually found over the deltoid muscle. Anhydrosis was found in the analgesic area in 3 of 6 patients, who were subjected to powerful stimulation of sweating; normal sweating was observed in the analgesic area in the other 3 patients.

Most of the service patients were fitted with abduction splints soon following the onset of the palsy. The civilian patients were given vitamin B_1 at various periods during the disability. Neither of these procedures appeared to alter the course of the disease in any way.

The course of 16 cases of rapidly developing painful dystrophy of the muscles of the shoulder girdle, attributed to brachial radiculitis, has been followed for a considerable period.

Ten cases have shown complete functional recovery in 8 to 18 months. Besides these, one was so far recovered at the end of five months that he returned to duty; a second with complete recovery on one side is recovering from a relapse on the other side; and a third is still showing slow recovery at the end of two years.

Of three cases that have been stationary or are deteriorating, one has little disability; the diagnosis in a second is doubtful; and only the third has a severe residual disability.

Recurrences developed in five cases; two at the end of six weeks; two at six months; and one at the end of five years.

Study of the Late Symptoms of Cases of Immersion Foot. Everett G. Fausel.

Surg., Gynec. & Obst. **81**:503 (Nov.) 1945.

A group of 65 patients were studied 14 months after the incurrence of immersion foot. Of these, 49 had been found to have complaints and 42 had been found to have abnormal physical findings associated with chronic peripheral vascular disease, secondary to immersion foot.

Secondary symptoms and findings following immersion foot are quite common and more persistent than usually thought. The main complaints are evidently rest pain, numbness of the legs or feet, subjective coldness of the legs or feet and increased perspiration of the extremities. The incidence of abnormal physical findings, particularly plantar ischema, development of superficial variocosities, and decreased peripheral arterial pulsation of the dorsalis pedis artery, mainly unilateral and corresponding to the primarily affected extremity, exists in a surprisingly high proportion of patients presenting complaints.

It is the opinion of the authors that these complaints and observations are on the basis of fibrosis of the extremity, secondary to the initial inflammatory reaction after immersion, rather than to secondary angiospasm.

The persistence of peripheral vascular disease, secondary to immersion foot, should be brought to the more serious attention of surgeons dealing with immersion foot. This is particularly true in view of the fact that these cases may be a source of future persistent disability and liability to the government.

The Treatment of Crushing Injuries of the Extremities. Southgate Leigh.

Virginia M. Monthly **72**:521 (Dec.) 1945.

Crushing injuries of the extremities produce as extensive shock as severe burns.

This shock should be treated as carefully as burn shock, using hematocrit or blood specific gravity levels to determine the amount of plasma that is necessary to balance the hemoconcentration.

A tourniquet must be kept on the crushed limb to prevent absorption.

All other factors that contribute to anoxia, or shock, i. e., excessive morphine, lowering head of table, excess heat and general anesthetics must be eliminated during shock.

Refrigeration anesthesia is the choice for operation under these circumstances.

Convalescence From Surgical Procedures. II. Studies of Various Physiological Responses to a Mild Exercise Test. Isaac Starr; Robert L. Mayock, and Marjorie G. Battles.

Am. J. M. Sc. **210**:725 (Dec.) 1945.

By means of a standard mild exercise test the authors have sought for abnormalities during convalescence from surgical procedures.

Oxygen consumption, and volume and rate of respiration have been determined before, during and after standard exercise. Cardiac output (ballistocardiogram) and pulse rate were estimated before, just after and five minutes following the same standard exercise.

Measurement of the magnitude of the changes induced by the exercise, revealed no significant differences which could be attributed to convalescence. However, when attention was given to the duration of the changes induced by the exercise, the averages showed significant differences, the increased oxygen consumption, respiration and pulse rate declining to the resting level more slowly during convalescence than before operation.

The respiration and oxygen consumption of subjects at rest were not significantly changed during convalescence.

The variability in the physiologic response to

exercise was so large that a test of the type used gives no promise of providing a satisfactory measure of the duration of convalescence in individual cases. However, the slow return to normal of pulse rate, respiration, and oxygen consumption after exercise is over may have some value as an indication of persisting abnormality in certain individuals and will provide significant differences when data obtained from a series of 10 or more cases are averaged.

Safety of Modern Alternating Positive and Negative Pressure Resuscitators. Henry Schwerma, and A. C. Ivy.

J. A. M. A. **129**:1261 (Dec. 29) 1945.

There is no evidence in this study that artificial respiration of the suck and blow type (+ 14 mm. of mercury and — 9 mm. of mercury) caused lung damage.

In 5 anesthetized dogs given artificial respiration with the E and J Resuscitator for one hour in the presence of natural breathing no evidence of emphysema was found.

The rate of return of blood pressure to the control level after the administration of curare was studied when dogs were given artificial respiration by various mechanical methods for one to three hours. The E and J Resuscitator was used on 20 dogs, the General Electric intermittent positive pressure Pneumolator on 7, the B intermittent positive pressure device on 8 and the Drinker Respirator on 7. No difference was found.

Conservative Treatment of Volkmann's Ischaemic Contracture. J. G. O'Connell.

Proc. Roy. Soc. Med. **38**:689 (Oct.) 1945.

That the flexion contracture of the fingers is diminished on palmar flexion of the wrist has been the basis of the various methods of treatment. The principle of gradual stretching of the contracted tissues would appear to have more foundation in theory than the various operative measures suggested, such as muscle slides and arthrodesis of wrist.

In an appreciable percentage of cases conservative treatment alone is inadequate and it becomes necessary to resort to operation. The operation most in favor would appear to be fixation of the wrist in the optimum position.

It will be noticed that the three cases described are about children. The method has not been tried in an adult and it seems likely that the prognosis would not be as good. The muscles of childhood have greater elasticity and would seem more suitable for such methods of passive stretching. The number of cases treated to date is small and the end-results may not be as satisfactory in a larger series of cases, but it is felt that no case of Volkmann's contracture in a child should be submitted to operation without at least a trial of conservative treatment.

Balneotherapy of Traumatic Nerve Infections. A. E. Kulkov, and V. N. Ogarev.

Nevropat i psikhiat. **12**:67, 1943.

Thirty-two cases of peripheral neuritis, including 8 cases of polyradiculitis with dissociation of albumin and cells in the cerebrospinal fluid (Guillain-Barre syndrome) are reported. They were treated with mud in addition to ordinary physical therapy and injections of vitamin B. Patients were usually seen one to three months after onset of the disease and received a course of 20 to 25 mud treatments, at a temperature of 40 to 46 C., three times weekly. All of the patients recovered and the time required was considerably less than a similar group treated the same way but without mud application.—[Abst. Am. Rev. Soviet Med. 3:180 (Dec.) 1945.]

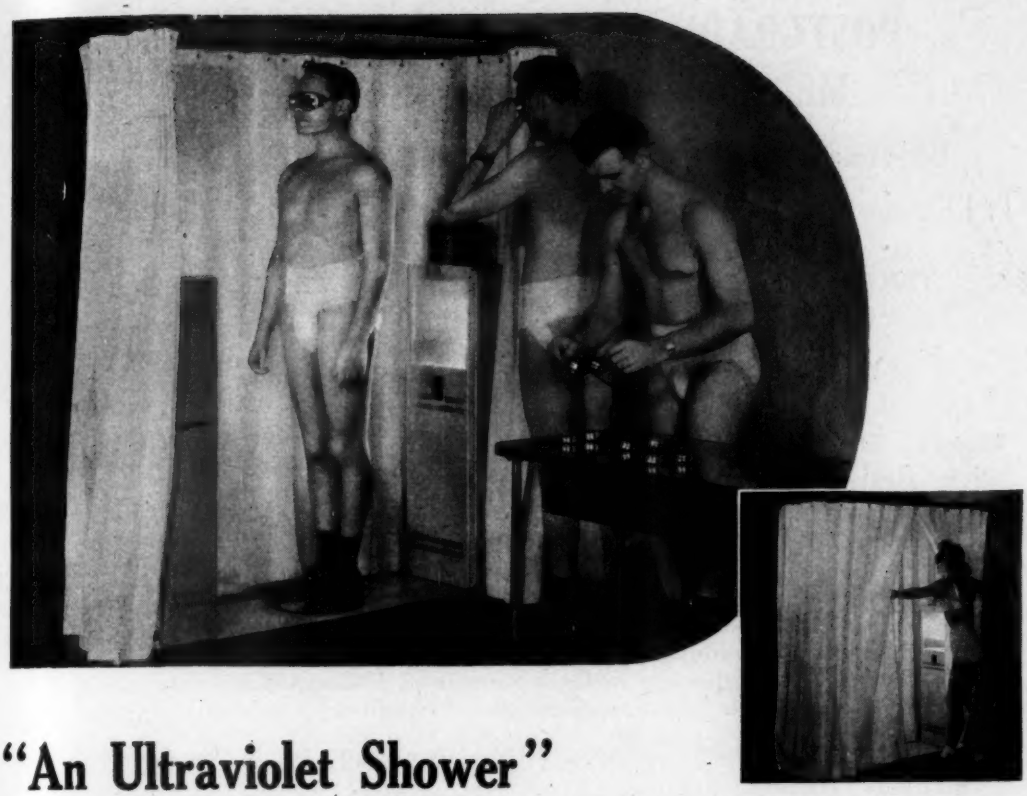
The Management of Convalescent Soldiers. Derek Levis.

J. Roy. Army M. Corps **85**:241 (Nov.) 1945.

Patients who are considered to require such treatment as the application of radiant heat, infra-red, ultraviolet light, massage and other electrical treatment are retained in Grades I and II until the need no longer exists. At no time does any patient receive this type of passive treatment to the exclusion of all other forms of active remedial treatment. The two are naturally complementary and are run concurrently.

Cases of fibrositis, backache and similar conditions which have frequently received extensive physical therapy during a prolonged stay in hospital are not unknown in this depot. Such cases are kept out of the department of physical therapy and class exercises with a manipulative feature are prescribed and executed. In any event those who receive physical therapy do the exercises as well.

It is amazing the amount of faulty posture and abnormal gait which is due to an hysterical element that is seen in such cases. It is equally satisfactory to see the improvement which can be effected with active exercises and firm handling.



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POSTGRADUATE COURSE IN PHYSICAL MEDICINE AND REHABILITATION

UNIVERSITY OF TEXAS—MEDICAL BRANCH, GALVESTON

MARCH 4-7, 1946

TENTATIVE PROGRAM FOR POSTGRADUATE COURSE IN PHYSICAL MEDICINE

Amphitheater, 4th Floor, Outpatient Building

Monday, March 4 —

8:45 Registration

Thermotherapy and Light Therapy—Local Heat, 9:00-12:15, C. D. Leake, Chairman

9:00 Dow—Local Application of Heat
10:00 Kovács—Medical Diathermy
11:00 Pruce—Thermotherapy in Orthopedics
11:30 Polmer—Thermotherapy in Affections of Muscle, Tendons, Bursae, etc.
12:00 Sako—Thermotherapy in Early Stages of Poliomyelitis
1:30-2:00 Movies on Local Application of Heat

Hyperthermia and Light Therapy, 2:00-5:15, Major A. B. C. Knudson, Chairman

2:00 Krusen—Present Status of Fever Therapy
3:00 Randall—Hyperthermia in Chorea
3:30 Movies
4:00 Kovács—Light Therapy

Tuesday, March 5 —

Hydrotherapy and Physical Medicine in Institutional Practice, 9:00-12:15, Selle, Chairman

9:00 Krusen—Hydrothermal Measures
10:00 Polmer—Local Hydrotherapy
10:30 Dow—Evaluation of Spa Therapy in Arthritis
11:00 Bennett—Physical Medicine in Poliomyeltiis
11:30 Kovács—Physical Medicine in Institutional Practice
1:30-2:00 Movie—Hydrotherapy

Miscellaneous Topics, 2:00-5:15, Bennett, Chairman

2:00 Polmer—Galvanic and Low Frequency Currents
2:30 Dow—Ion Transfer (Indications for, Technics, Limitations)
3:00 Weisz—Electrodiagnosis
3:20 Snodgrass—Electrosurgery
3:40 Harris—Electric Shock Therapy, Its Indications and Use
4:00 Herrmann—Physical Medicine in Peripheral Circulatory Diseases
4:30 Pruce—Plaster Cast Moulded for Function
4:45 Knudson—Crutch Walking

Wednesday, March 6 —

Muscle Testing, Exercise, Massage, 9:00-12:15, Eggers, Chairman

9:00 Bennett—Muscle Testing
9:30 Bennett—Exercise and Muscle Stimulation

10:00 Stewart—Exercise in Orthopedics
10:30 Pruce—Splintage in Peripheral Nerve Injuries
11:00 Krusen—Massage (Methods, Indications, Limitations)
11:45 Molner—The Kenny Method

Physical Medicie in General Practice and the Medical Specialties, 2:00-5:15

2:00 Poth—Physical Medicine in General Surgery
2:15 Stewart—Physical Medicine in Orthopedic Surgery
2:30 Ewalt—Physical Medicine in Neuropsychiatry
2:45 Daily—Physical Medicine in Ophthalmology
3:15 Ritchie—Physical Medicine in Dermatology
3:30 Hansen—Physical Medicine in Pediatrics
3:45 Kovács—Physical Medicine in General Practice
4:15 Krusen—Abuse of Physical Medicine

Wednesday Evening —

Dinner Galvez Hotel—6:30—Chauncey Leake, Toastmaster
Kovács—Historical Development of Physical Medicine
Krusen—Future of Physical Medicine

Thursday, March 7 —

Rehabilitation, 9:00-12:30, Dow, Chairman

Bennett—Recognition and Treatment of Common Deformities Found in Convalescent Poliomyelitis
Molner—Activities of the National Foundation for Infantile Paralysis
Tenney—Rehabilitation of Texas Children
Eggers—Muscular Education of Adolescence
Polmer—Physical Medicine in Traumatic Neuroses
Decherd—Status of Abuse of Rest in Rehabilitation

Rehabilitation Continued, 2:00-5:00, Pruce, Chairman

Kovács—Physical Therapy in Peripheral Nerve Injuries
Brown—Occupational Therapy and Rehabilitation
Dow—Physical Therapy in Relation to Military Medicine
Knudson—Activities of the Veterans Administration in Rehabilitation
Krusen—Physical Medicine in Civilian Rehabilitation (Backache, Arthritis, Orthopedic Problems)

Registration—In order to determine what attendance may be expected, physicians planning to attend the four-day session are requested to register in advance with Dr. George M. Decherd, Director of Postgraduate Study. A nominal fee of $15.00 will be charged to cover certain administrative costs of the course. There also will be a $2.00 fee for a postgraduate certificate for those who desire it. The main expenses of the course are to be met by special university funds. Physicians attending for a single day and hospital administrators and physical therapists are invited to register as guests and may attend whatever sessions they desire without charge. Those of the latter groups who plan to attend part or all of the meetings are requested to communicate with the office of the undersigned so that plans for entertainment may be arranged.

Hotel Reservations—While individuals will be expected to make their own hotel reservations, this office will be glad to assist those experiencing difficulty in securing accommodations. Several hotels—Galvez, Buccaneer and Jean LaFitte—are recommended.

W. A. SELLE,
Professor of Physiology, University of Texas, Medical Branch.

APPROVED SCHOOLS FOR PHYSICAL THERAPY TECHNICIANS

Council on Medical Education and Hospitals of the American Medical Association

Name and Location of School	Medical Director	Technical Director	Regular Course: Entrance Requirements*	Length in Months	Classes Start	Tuition	Certificate, Diploma, Degree
Children's Hospital, Los Angeles	Samuel S. Mathews	Lily H. Graham	a-b-c	12	FebAug	$200	Diploma
College of Medical Evangelists, Los Angeles[1]	Fred B. Moor	A. H. Carlson	c	12	JanJuly	$215	Cert. or Degree
University of California Hospital, San Francisco[1]	Frances Baker	Margery L. Wagner	e	12	MarOct	$150	Certificate
Stanford University, Stanford University, Calif.[1]	Wm. H. Northway	Lucille Daniels	a-b-d[2]	10	Quarterly	$409	Cert. or Degree
Northwestern University Medical School, Chicago	John S. Coulter	Gertrude Beard	a-b-d	9	JulyOct	$200	Certificate
State University of Iowa Medical School, Iowa City	W. D. Paul	Olive Farr	b-e	12	Dec	None	Certificate
University of Kansas School of Medicine, Kansas City[1]	Gordon M. Martin	Ruth Monteith	a-b-c[2]	10	FebSept	$50[4]	Cert. or Degree
Bouvé-Boston School of Physical Education, Boston	Arthur L. Watkins	Constance K. Greene	c[3]	36	Sept	$400 yr.	Degree
Harvard Medical School, Boston	Frank R. Ober	Janet B. Merrill	a-b-d	9	Varies	$300	Certificate
Boston University, College of Physical Education for Women, Sargent College, Cambridge, Mass.	Louis Howard	Adelaide L. McGarrett	H.S.	36	Oct	Varies	Degree
University of Minnesota, Minneapolis[1]	Miland E. Knapp	Sara E. Kollman	a-b	12	June-Sept		Cert. or Degree
Barnes Hospital, St. Louis	F. H. Ewerhardt	Beatrice F. Schulz	a-b-c	9	Oct	$200	Certificate
St. Louis University School of Nursing St. Louis[1]	Alex. J. Kotkis	Sr. M. Imelda	a-b-c[3]	9	Sept	$250 yr.	Cert. or Degree
Columbia University, New York City[1]	Wm. B. Snow	Josephine Rathbone	a-b-c	10	FebSept	$480	Certificate
New York University School of Education, New York City[1]	Geo. G. Deaver	Elizabeth Addoms	a-b-c	9	FebSept	$450	Cert. or Degree
Duke Hospital, Durham, N. C.[1]	Lenox Baker	Helen Kaiser	a-b-c	12	Oct	$200	Certificate
Cleveland Clinic Foundation Hospital, Cleveland	Walter J. Zeiter	Anna Wetterhuus	a-b-c	9	Sept	None	Certificate
D. T. Watson School of Physiotherapy, Leetsdale, Pa.[1]	Jessie Wright	Kathryn Kelley	a-b-d	12	Oct	$200	Diploma
Graduate Hosp. of the Univ. of Pennsylvania, Philadelphia[1]	Geo. M. Piersol	Katharine S. Sutherland	a-b-c	12	Sept	$200	Certificate
University of Texas School of Medicine, Galveston[1]	G. W. N. Eggers	Ruby Decker	a-b-c	9	Jan.	$100[4]	Certificate
Baruch Center of Physical Medicine and Richmond Professional Institute, Richmond, Va.[1]	F. A. Hellebrandt	Josephine J. Buchanan	a-b-c	12	Sept	$200[4]	Cert. or Degree
University of Wisconsin Medical School, Madison[1]	Elizabeth Grimm	Margaret A. Kohli	a-b-c	9	Sept	Varies	Certificate

* Courses are so arranged that any of the entrance requirements will qualify students for training. a = Graduation from accredited school of nursing; b = Graduation from accredited school of physical education; c = Two years of college with science courses; d = Three years of college with science courses; e = Coll. deg., science; H. S. = High school graduation.

1. Male students admitted.
2. High school graduates accepted for four-year course leading to A.B. degree; students admitted quarterly and tuition is $143 per quarter.
3. High school graduates admitted to four-year college course.
4. Non-residents charged additional fee.

APPROVED SCHOOLS FOR OCCUPATIONAL THERAPY TECHNICIANS

Council on Medical Education and Hospitals of the American Medical Association *

NOTE: The duration of the course is expressed in academic years and in most schools the accelerated curriculum is being followed.

Name and Location of School	College Affiliation	Duration of Course	Classes Start	Entrance Requirements	Tuition Per Year	Certificate, Diploma, Degree	Graduates in 1944
University of Southern California, 3551 University Ave., Los Angeles	University of Southern California	2 yrs. 5 yrs.	Fall term Every semester	College deg. High sch.	$330 $330	Certificate B.S.&Cert.	3
Mills College, Oakland, Calif.	Mills College	5 yrs.	FebSept	High sch.	$475	Cert. & Deg.	None
San Jose State College, San Jose, Calif.	San Jose State College	3 yrs.	Every quarter	1 yr. coll. High sch.	$21 $21	Certificate Degree	5
University of Illinois College of Medicine, 1853 W. Polk St., Chicago	University of Illinois	4½ yrs.	Varies	High sch.	$80	B. S.	None
University of Kansas, Lawrence	University of Kansas	4½ yrs.	Every semester	High sch.	$25	B. F. A. & Cert.	1
Boston School of Occupational Therapy, 7 Harcourt St., Boston	Tufts College	3 yrs. 5 yrs.	Varies Sept	1 yr. coll. High Sch.	$400 $400	Diploma Diploma & Deg.	58
Kalamazoo School of Occupational Therapy, Western Michigan College of Education, Kalamazoo	Western Michigan College of Education	3 yrs.	FebOct	1 yr. coll.	$76[1]	Dipl. & B. S.	14
Michigan State Normal College, Ypsilanti	Michigan State Normal College and Univ. of Michigan	5 yrs.	SeptFeb June	High sch.	$67	Cert. & Deg.	7
St. Louis School of Occupational and Recreational Therapy, 4567 Scott Ave., St. Louis	Washington University	3 yrs.	Oct	2 yrs. coll.	$350	Dipl. & Deg.	17
Columbia University, 630 W. 168th St., New York City	Columbia University College of Physicians and Surgeons	3 yrs.	FebSept	2 yrs. coll.	$380	Cert. & B. S.	23
New York University School of Education, 100 Washington Sq. E., New York City	New York University	4½ yrs.	Quarterly	High sch.	$475	Cert. & B. S.	4
Ohio State University, Columbus	Ohio State University	4½ yrs.	Quarterly	High sch.	$75	Degree	3
Philadelphia School of Occupational Therapy, 419 S. 19th St., Philadelphia	University of Pennsylvania	3 yrs.	Nov.	1 yr. coll.	$400[2] $400[3]	Diploma Degree	65
Richmond Professional Institute, 901 W. Franklin St., Richmond, Va.	College of William and Mary	3 yrs.	FebSept	1 yr. coll.	$220	Certificate	5
Milwaukee-Downer College, Dept. of Occupational Therapy, 2512 E. Hartford, Milwaukee 11	Milwaukee-Downer College	3 yrs. 5 yrs.	Sept Sept	1 yr. coll. High sch.	$250 $250	Diploma B. S. & Diploma Certificate	26
Mount Mary College, 2900 Menomonee River Dr., Milwaukee	Mount Mary College	5 yrs.	Sept	High sch.	$210	B. S.	7
University of New Hampshire, Durham, N. H.	Univ. of New Hampshire	4½ yrs.	SeptFeb	High sch.	.....	Degree	None
University of Toronto, Dept. of University Extension, Toronto, Ont., Canada	University of Toronto	3 yrs.	Sept	1 yr. coll.	$188	Diploma	34

1. Non-residents charged additional fee.
2. $400 per yr. for each of first two years; $200 for third yr.
3. $400 per yr. for each of first four years; $200 for fifth yr.

* Reprinted in part J. A. M. A. 127:848 (March 3) 1945.

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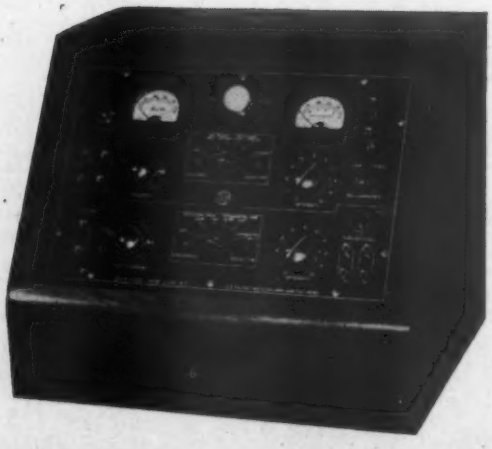

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PARTIAL LIST of PAPERS SUBMITTED for PUBLICATION in *ARCHIVES* DURING 1946

The Adaptability of Present Day Concepts of Convalescent Training and Physical Rehabilitation to the Civilian Practice of Medicine. F. A. Hellebrandt, M.D., Richmond, Va.

Psychiatry Needs Occupational Therapy. Blanche Montgomery Meyer, M.D., Instructor, Medicine, Ohio State University Medical School; President, Ohio State Occupational Therapy Association, Columbus, Ohio.

The Challenge of Crutches. George G. Deaver, M.D., Associate and Medical Director, Institute for the Crippled and Disabled; and Mary Eleanor Brown, M.A., Physical Therapy Technician, Institute for the Crippled and Disabled, New York.

The Effects of Hypothermia and Hyperthermia on Motor End Plates in Skeletal Muscle. Eben J. Carey, M.D., Dean, Marquette University School of Medicine, Milwaukee, Wisconsin.

Walking Reeducation, Practical Demonstration and Discussion Presented by the Ohio Chapter of the American Physiotherapy Association.

The Treatment of Sciatica by Alternating Current. Abraham Cohen, M.D., Philadelphia.

The Physics of Short Wave Therapy. Kurt S. Lion, Department of Biology and Biological Engineering, Massachusetts Institute of Technology, Cambridge, Mass.

Studies on Neuromuscular Dysfunction. V. Neostigmine Therapy of Acute and Chronic Backache. Herman Kabat, M.D., Ph.D., Passed Assistant Sanitarian (R); and Charles W. Jones, M.D., Passed Assistant Surgeon (R). From the Division of Public Health Methods and the Hospital Division, United States Public Health Service, Bethesda, Md.

Recognition and Treatment of Common Deformities Found in Convalescent Poliomyelitis. Robert L. Bennett, M.D., Director, Graduate School of Physical Therapy; Director of Physical Medicine, Georgia Warm Springs Foundation, Warm Springs, Ga.

Results of Kenny Treatment of Infantile Paralysis in the Acute Stage. Miland E. Knapp, M.D., Clinical Professor, Radiology and Physical Therapy, University of Minnesota Hospital, Minneapolis.

Artificial Fever-Chemotherapy. (From the Fever-Chemotherapy Section, Chicago Intensive Treatment Center of the Chicago Board of Health.) H. Worley Kendell, Surgeon (R) U. S. P. H. S., Chicago; Robert C. Craig, P.A. Surgeon (R) U. S. P. H. S., Chicago, and George X. Schwemlein, P.A. Surgeon (R) U. S. P. H. S., Chicago.

Graphic Method for Rapid Estimation of Clinical Status in Poliomyelitis. E. T. Williams, M.D.; F. H. Top, M.D., and Louise Suchomel, R.N., Detroit, Mich.

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WANTED — BACK ISSUES OF THE ARCHIVES

September, 1944

January, 1945

February, 1945

March, 1945

American Congress
of Physical Medicine
30 North Michigan Avenue
Chicago 2, Illinois

MEETINGS OF INTEREST TO THOSE IN THE FIELD OF PHYSICAL MEDICINE

In these columns will be published information about meetings of interest to those in the field of physical medicine. New data should be sent promptly to the office of the Secretary, 2 E. 88th St., New York 28, N. Y.

American Congress of Physical Medicine, 24th Annual Session, Hotel Pennsylvania, New York, September 4, 5, 6 and 7, 1946; **Instruction Course** to be held during the meeting; Dr. Richard Kovács, 2 East 88th Street, New York 28, Secretary. See announcement elsewhere this issue.

Eastern Section, American Congress of Physical Medicine, Walter Reed General Hospital, Washington, D. C., Saturday, April 13. Dr. G. J. Barger, 1125 Buchanan Street, N. W., Washington 11, D. C., Secretary.

Midwestern Section, American Congress of Physical Medicine, Chicago, Illinois. Watch for announcement of date and program. Dr. C. O. Molander, Michael Reese Hospital, Chicago, Secretary.

National Rehabilitation Association, Hotel La Salle, Chicago, Illinois, May 13, 14 and 15, 1946. Mr. H. Earle Correvont, Director of Vocational Rehabilitation for Michigan, Chairman of Program Committee.

New York Society of Physical Medicine; meetings on first Wednesday, from October to May, New York City; Dr. Madge C. L. McGuinness, 51 East 87th Street, New York 28, Secretary.

The Pennsylvania Academy of Physical Medicine; meetings at the Philadelphia County Medical Building, 21st and Spruce Streets. For 1946 schedule inquire of Secretary, Dr. Harold Lefkoe, 1824 Spruce Street, Philadelphia 3.

Southern California Society of Physical Medicine, Secretary-Treasurer, Dr. Clarence Dail, 802 Acacia Street, San Gabriel, Calif.

National Council on Rehabilitation; Fourth Annual Meeting, Ritz-Carlton Hotel, New York City, April 24 and 25, 1946; Executive Director, Chauncey S. Truax, 1790 Broadway, New York 19, N. Y.

American Physiotherapy Association, Annual Conference, June 16 to 22, 1946, Blue Ridge, N. C. Mildred Elson, Executive Secretary, 1790 Broadway, New York 19, N. Y.

INSTRUCTION COURSE

In Conjunction with the

24th Annual Scientific and Clinical Session

AMERICAN CONGRESS OF PHYSICAL MEDICINE

September 4, 5, 6, 7, 1946

HOTEL PENNSYLVANIA **NEW YORK, N. Y.**

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